Electrical World

NOVEMBER 25, 1944

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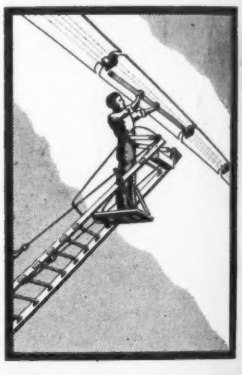
SEMI-OUTDOOR PLANT BUILDING ONLY THIRD AS LARGE

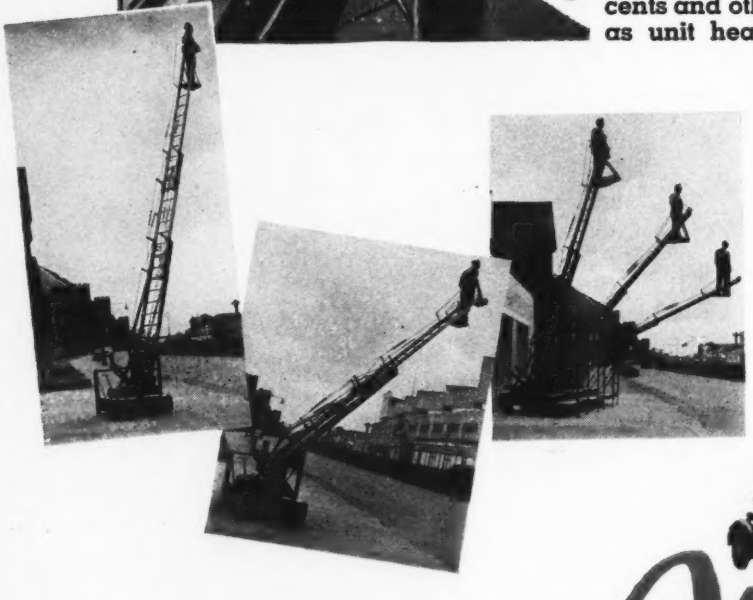
HOW *crows'nest* REPLACES MILES OF MAKESHIFTS!

Dancing days are over for Ruth Johnson, 24, former showgirl, now learning to be aviation mechanic at LaGuardia Field. Here she is seen at work on fin of one of huge multimotored transports. —Story on Page 14
SUNDAY NEWS
NEW YORK'S PICTURE NEWSPAPER

UP-IN-THE-AIR-JOBS DONE *SPEEDILY* AND SAFELY FROM THE PLATFORM OF THIS AERIAL LADDER

Up-in-the-air-work in industries of every sort has found new safety, new speed, new flexibility due to the Murray Crows'nest aerial ladder. It has long been the standard maintenance ladder of the electrical industry. It may be mounted on a variety of bases, from motor trucks to caster trailers, live skids, wagon trailers, etc. — whichever best suits individual plant conditions. It is particularly efficient for servicing — without interrupting production — fluorescents and other luminaires, as well as unit heaters, sprinkler heads, painting. Many are being used for servicing and inspecting planes at air fields and modification centers. Metropolitan Device Corporation, Brooklyn 16, N. Y.





Metropolitan Device Corp.
Brooklyn 16, N. Y.

Send data (without obligation) on Murray Crows'nest suitable for our requirements.
Ladder must reach feet high, and extend feet side-ways. Aisle width is feet.

Name and Title_____

Company_____

Address_____

Murray

DEMOUNTABLE *crows'nest*

Electrical World

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 70 YEARS

November 25, 1944 — Vol. 122, No. 22

Contents

Counterpoise Grounding Protects High Voltage Lines 66
A. S. RUNCIMAN, Shawinigan Water & Power Co.

Semi-Outdoor Plant Simple, Compact, Convenient 70
LOUIS ELLIOTT, Ebasco Services, Inc.

Board for Long Tests of Demand Meters 73
A. J. HOLTHAUS, Illinois Power Co.

Mystic Switching Station Design Keynotes Simplicity, Reliability—II 74
WILLIAM W. EDSON, Boston Edison Co.

Rectifiers Convert Newspaper Plant with Various Gains 77
B. J. FOLEY, Evening News Publishing Co.

Sleeveless Duct-Splice Devised for Lead-Sheath Cable 80
J. B. BOWEN and J. G. BROWN, San Diego Gas & Electric Co.

Editorials ..... 65 and 82

Washington Comment 84

News of the Week 85

HOW 93

Load Servicing 120

New Equipment 124

News About People 129

Manufacturing and Markets 132

Sales Opportunities 136

Letter to the Editor 138

Rural Allotments 141

Index of Advertisements 144

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McGRAW-HILL PUBLISHING COMPANY,
330 West 42nd Street, New York 18, N. Y.
Director of Circulation:

Please change my address on Electrical World

From .....

To .....

.....

Signed .....

.....

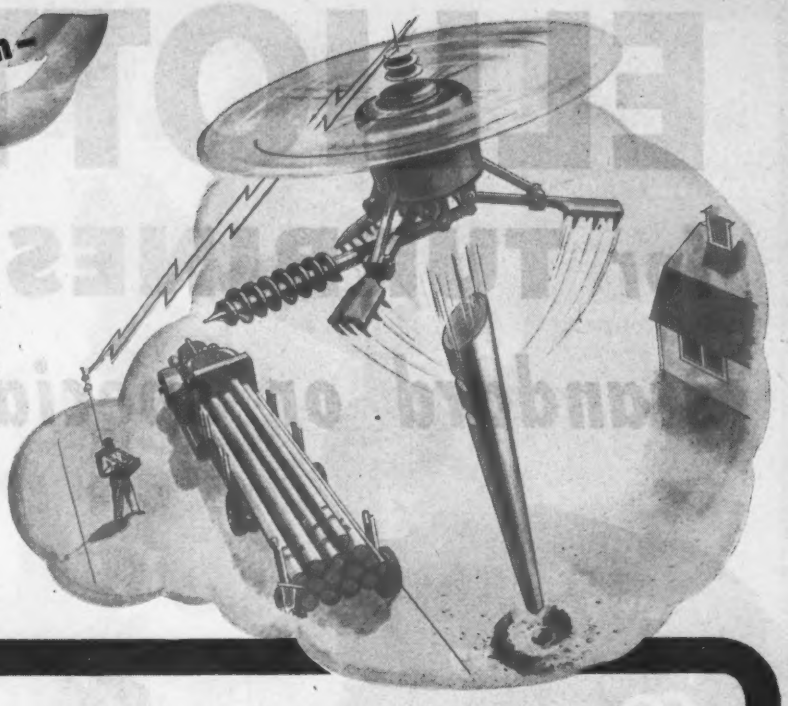
GET RID OF THE Sacred Cow IN WIRING!
In electrical wiring of buildings, the costly custom of using No. 14 has blocked progress toward adequate wiring like the sacred cow on an Indian road. The Hindu, you recall, reveres the cow and will not disturb it, regardless of time or place. But, if our buildings of tomorrow are to have proper wiring, then sacred cows like No. 14 must yield to progress.
A first and basic step towards realization of the adequately wired building should be insistence that the sacred cow of No. 14 must go. Its anemic circuits have deprived many a building of full use of available power. To take full advantage of the electrical world of tomorrow, wiring must be planned with an eye to the future for the greater use of electrical equipment. The Okonite Company, Passaic, N. J
OKONITE and HAZARD
insulated wires and cables
To wire a building adequately, no smaller wire than No. 12 should be specified. Only one size larger, it will carry one third more current, reduce voltage drop by more than a third, deliver more power for your money and yet requires no larger conduit or fittings.
ADEQUATE WIRING
THE KEY TO INCREASED PRODUCTION
3874

MEMO:
to my SECTY
"TELL ALL POWER SALES-MEN
to push this that HARD
It's GOOD for us AND GOOD for the PLANT OWNER"

Post-war pipe dreams you better not count on—

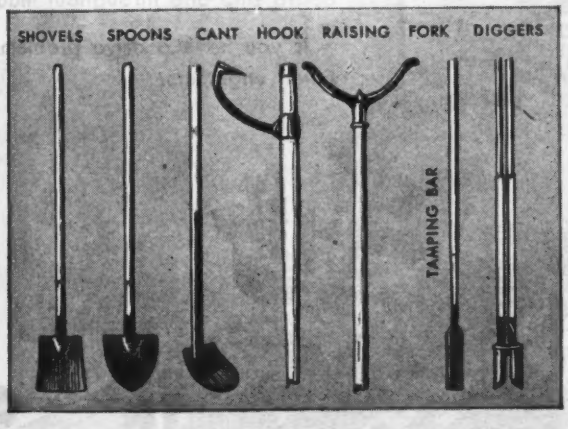
HELICOPTER POLE ERECTOR

It digs the hole, picks up and positions the pole and drops it unerringly into place — all under automatic control from an electronic panel. It may come sometime, but don't expect it by V-day.



BUT RIGHT NOW YOU CAN PLAN TO—

RE-EQUIP FOR FASTER WORK WITH STRONG NEW OSHKOSH TOOLS



There is a special Oshkosh tool for every pole-line job from digging the hole to positioning the pole: Shovels, spoons, peavies, cant hooks, pike poles, carrying tools, raising forks, tamping bars, diggers and many others. Each is designed by Oshkosh to do its specific job in a way that's less tiring to the user. Special steels, of just the right type and hardness, help to keep Oshkosh tools highly efficient by minimizing wear and deformation. Straight-grained wood handles give fine balance and long-lasting strength. And, like so many other pole-line tools and materials, Oshkosh tools reach you locally via Graybar.

GRAYBAR'S NATIONWIDE NETWORK

of more than 80 warehouses assures you a convenient local source of supply for more than 60,000 electrical items—backed by experienced power transmission and distribution application aid, plus assistance on problems of lighting, wiring and communication. A Graybar Man near you is ready to make your electrical supply problems his personal responsibility. Why not take advantage of his time-saving assistance?

5536

via GraybaR

ATTENTION—MANUFACTURERS OF ELECTRICAL EQUIPMENT AND APPLIANCES:

To help plan for more efficient post-war distribution—national or regional—write for this new booklet: "Tomorrow's Electrical Distribution—via Graybar."

GRAYBAR ELECTRIC COMPANY

IN OVER 80 PRINCIPAL CITIES

Executive Offices: 420 Lexington Ave., N. Y. 17, N. Y.

ELLIOTT

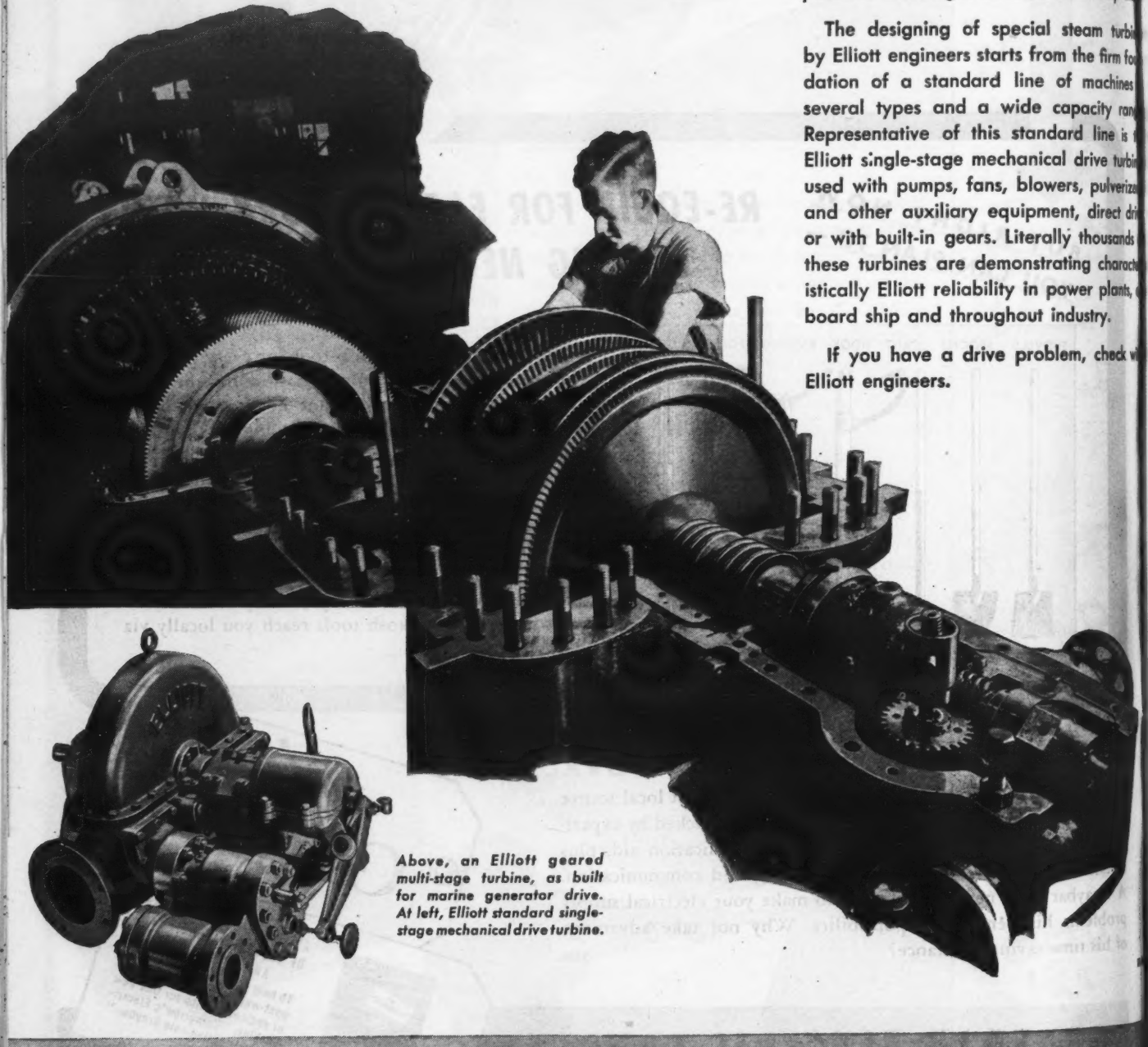
for TURBINES—

standard or special

"Tailored to the job" has become a st
phrase in speaking of Elliott steam turbi
So many of them are engineered for spe
conditions, such as the unit pictured at
left. This turbine is one of a large num
of identical units designed for a spe
wartime service. These turbines each d
three generators in line, through gears wh
reduce the 5600-rpm. turbine speed to
generator speed of 1200 rpm. They
pass the most rigid tests before acceptan

The designing of special steam turbi
by Elliott engineers starts from the firm fo
dation of a standard line of machines
several types and a wide capacity ran
Representative of this standard line is
Elliott single-stage mechanical drive turbi
used with pumps, fans, blowers, pulverize
and other auxiliary equipment, direct dri
or with built-in gears. Literally thousands
these turbines are demonstrating charact
istically Elliott reliability in power plants,
board ship and throughout industry.

If you have a drive problem, check wi
Elliott engineers.



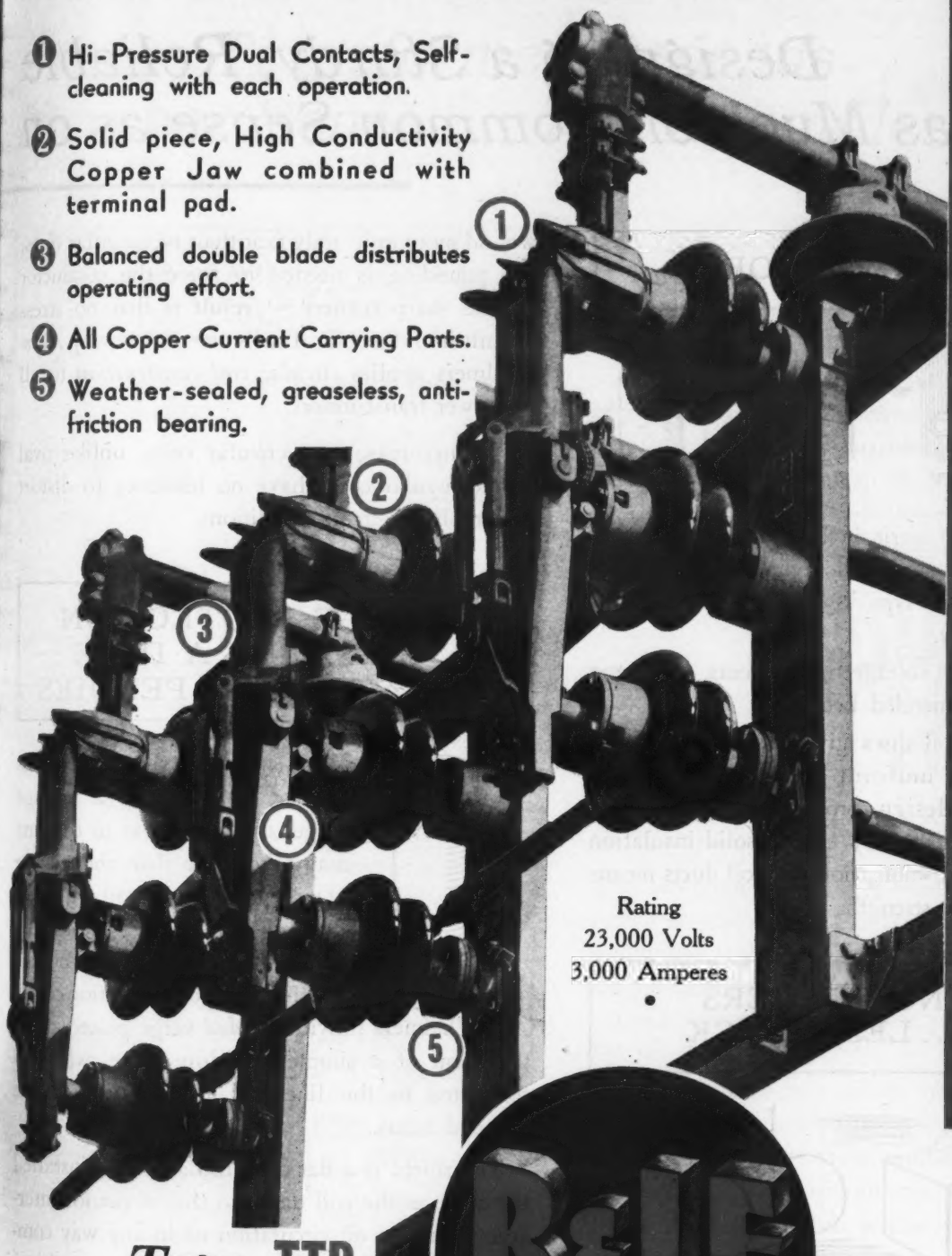
Above, an Elliott geared multi-stage turbine, as built for marine generator drive. At left, Elliott standard single-stage mechanical drive turbine.

ELLIOTT COMPANY *Steam Turbine Department,* **JEANNETTE,**

STEAM TURBINES • GENERATORS • MOTORS • CONDENS
FEEDWATER HEATERS AND DEAERATORS • STEAM JET EJECT
CENTRIFUGAL BLOWERS • TURBOCHARGERS FOR DIESEL ENGI
TUBE CLEANERS • STRAINERS • DESUPERHEATERS • FILT

CHECK the FACTS

1. Hi-Pressure Dual Contacts, Self-cleaning with each operation.
2. Solid piece, High Conductivity Copper Jaw combined with terminal pad.
3. Balanced double blade distributes operating effort.
4. All Copper Current Carrying Parts.
5. Weather-sealed, greaseless, anti-friction bearing.



Rating
23,000 Volts
3,000 Amperes

Type **TTR-** **R&IE**

HEAVY DUTY DISCONNECTING SWITCHES

The Check List

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES
INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SECTIONALIZING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

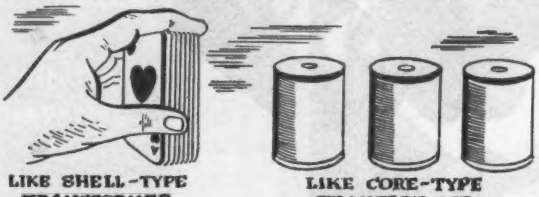
RAILWAY AND INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.

IN CANADA—EASTERN POWER DEVICES, LIMITED, TORONTO

A Power Transformer

Designing a Sturdy, Reliable as Much on Common Sense as on

1. SHELL OR CORE?



LIKE SHELL-TYPE TRANSFORMER

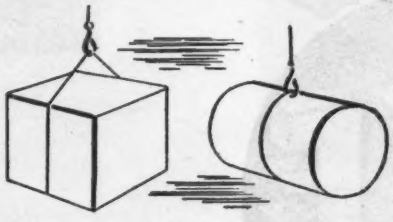
LIKE CORE-TYPE TRANSFORMER

THERE IS GREAT merit in building transformers *both* ways. For small, moderate voltage transformers, the core type is recommended by its greater simplicity.

For large, high voltage transformers, shell type design is recommended because:

1) Vertical coil discs give less capacitance to ground...more uniform voltage distribution. 2) Shell type design provides sturdy bracing against over-currents. 3) Use of solid insulation between coils in combination with oil ducts means highest dielectric strength.

2. NO CORNERS ...LESS SLACK



JUST AS IT IS easier to pull a rope tight around a barrel than a packing case, so circular coils can be wound more uniformly taut than rectangular ones. No pounding is needed to force the conductor around sharp corners — result is that no stress is built into the coil! That's one reason why Allis-Chalmers applies *circular coil construction* to all its power transformers.

Another reason — circular coils, unlike oval or rectangular coils, have no tendency to distort under short circuit conditions.

3. SURGE PROTECTION FITS LIKE A DIME ON A STACK OF PENNIES

WHEN AN UNSHIELDED transformer is struck by a voltage surge, the turns next to the line may take more than their share of punishment from voltage stress.

While the overall design of a shell type transformer smooths out the voltage distribution curve, Allis-Chalmers provides *added* surge protection in the form of a simple shielding plate, which is connected to the line and placed next to the line-end turns.

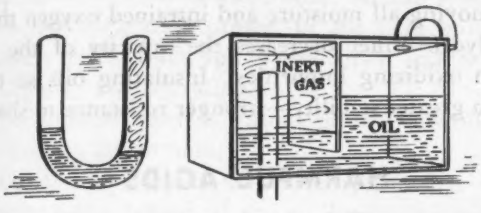
The shield is a flat disc insulated and installed the same as the coil discs, so that it cannot interfere with free oil circulation or in any way complicate the transformer assembly. The combination of shell type design and shield gives ideal simple surge protection.

Invest in ALLIS-CHALMERS

Isn't All Mathematics

Power Transformer Depends Number Sense . . . For Example:

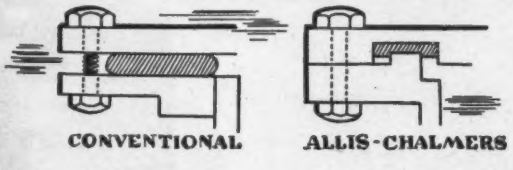
4. VALVELESS INERT GAS SYSTEM



YOU NEEDN'T think in terms of increased maintenance when considering inert gas protection for transformer oil.

As an alternative to a high pressure system, Allis-Chalmers recommends the use of its simple Oil-Sealed inert gas system . . . with no complicated valve mechanisms, high pressure tanks, or moving parts to wear and cause trouble. Maintenance on the Oil-Sealed inert gas-protected transformer is no greater than for a transformer with conventional expansion tank!

5. METAL-TO-METAL CONTACT AT GASKETED JOINTS

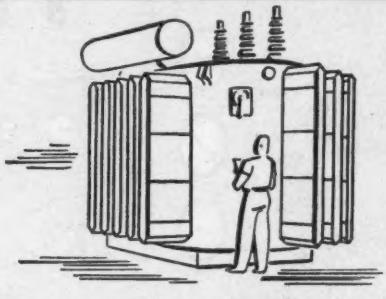


HOW WELL gaskets perform their function of keeping joints in a transformer tank oil-tight largely depends on how much they are compressed.

Conventional gasketing (see artist's sketch) may result in over-compression or under-compression — and oil leaks in either case.

Allis-Chalmers metal-to-metal contact at gasketed joints insures *most efficient* gasket compression . . . prevents stress on gaskets . . . means longer-lasting protection against oil leaks.

6. SAFE . . . CONVENIENT



THE NO-LOAD tap changer handle may be placed either on the cover of a transformer or on the side of the tank. On Allis-Chalmers transformers, the no-load tap changer is always arranged with operating handle and position plate mounted *on the side.*

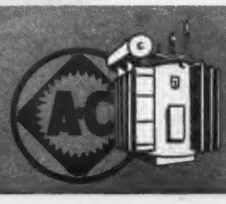
Thus tap positions can be observed from the ground level while the transformer is in service—no danger to personnel from approaching high voltage bushings. Tap positions are easily changed, too.

For the full story on power transformers, call your nearby A-C district office, or write ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

♪ *Tune in the Boston Symphony, Blue Network, every Sat. Eve.*

A 1790

Power Transformers



Electrical INSULATING OILS

with the HYDROVOLIFIER

HOW IT WORKS

The Hydrovolifier offers a simple physical process, based on temperature and pressure, for the thorough treatment of transformer and circuit breaker oils.

Solid particles are first removed through a mechanical filter. The oil is then forced through high pressure atomizing nozzles into a vacuum chamber. This high-low-pressure shock treatment transforms all water (both free and in solution), air and volatile (corrosive) acids into vapor, which is drawn off and discharged. Finally, a blotter filter removes any remaining suspended solids from the dry oil.

REMOVES MOISTURE

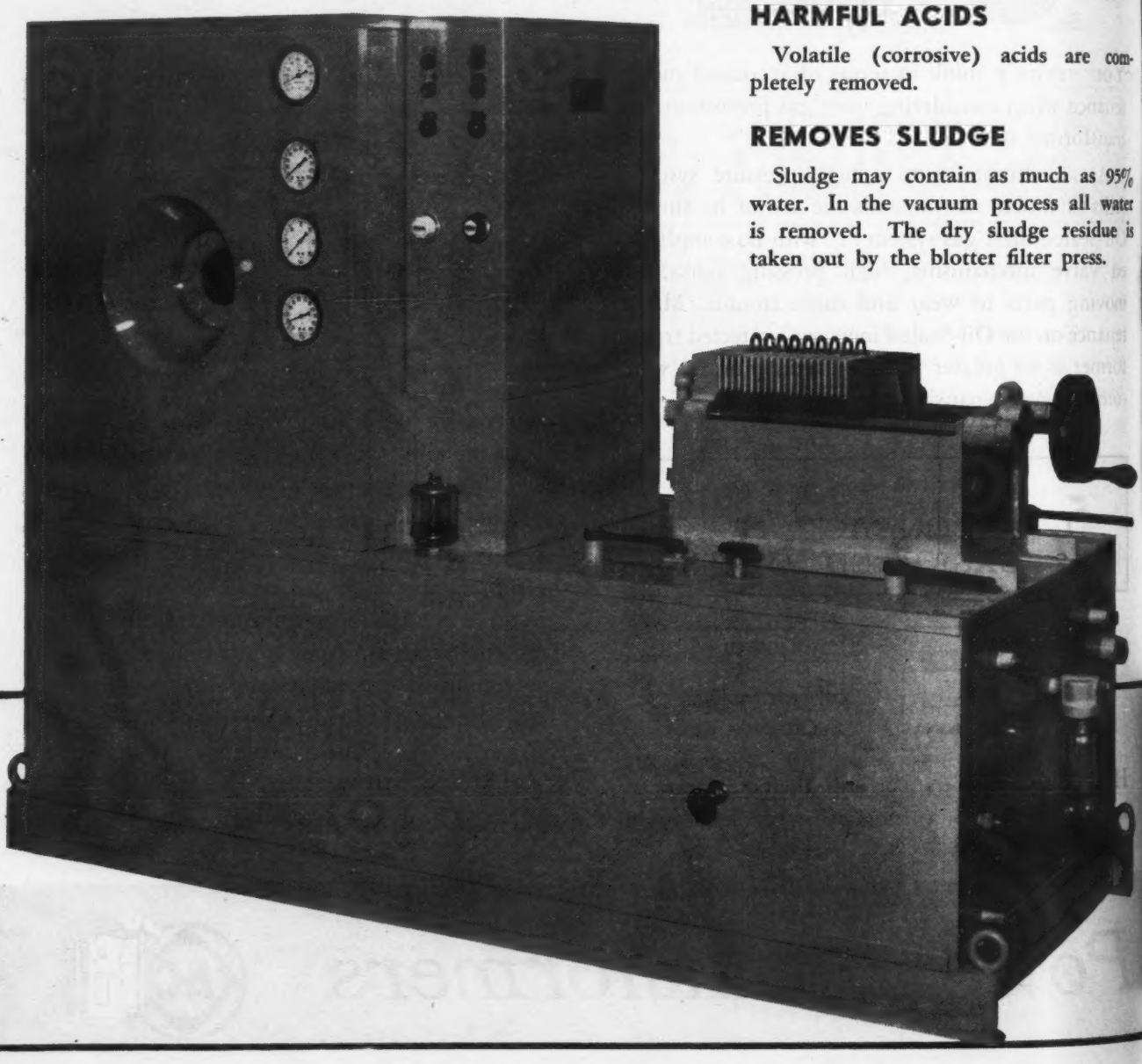
Removing all moisture and intrained oxygen through the Hydrovolifier decreases the capacity of the oil to absorb oxidizing impurities. Insulating oils so treated show a greater stability—stronger resistance to sludging.

HARMFUL ACIDS

Volatile (corrosive) acids are completely removed.

REMOVES SLUDGE

Sludge may contain as much as 95% water. In the vacuum process all water is removed. The dry sludge residue is taken out by the blotter filter press.



CLEANED—DEHYDRATED—DEGASIFIED—STABILIZED

CAPACITY

The capacity of the Hydrovolifier is based on providing a specified degree of oil purification. *In a single pass* the machine will yield a complete moisture and gas free oil at its rated gallons per hour capacity.

SIMPLE, LOW-COST OPERATION

The Hydrovolifier permits servicing of transformers in place without service interruption. Or it may be used to treat insulating oil removed from service at any storage point on the system.

For servicing transformers in the field only three connections have to be made — the inlet and outlet lines and the power circuit. One man can handle the operation.

The Hydrovolifier is automatically controlled and requires no special adjustments in the field.

In comparative tests the Hydrovolifier has turned out *in a single pass* over an equal period of time a larger quantity and better quality of oil than other equipment having twice its rated capacity.

There are no deposits on pans or trays to be removed. No cleaning is required, except for occasional changing of the blotter paper and infrequent draining of the primary filter sump chamber.

AUXILIARY USES

The Hydrovolifier may also be used for drying under vacuum transformer cores, oil piping, and drums. It will remove all water present as a result of sweating or temperature changes.

THREE STANDARD SIZES:

H V — 100 — CAPACITY — 100 GALLONS PER HOUR
H V — 300 — CAPACITY — 300 GALLONS PER HOUR
H V — 500 — CAPACITY — 500 GALLONS PER HOUR

BUCKEYE
LABORATORIES CORP.

1965 E. 66TH STREET — CLEVELAND 3, OHIO

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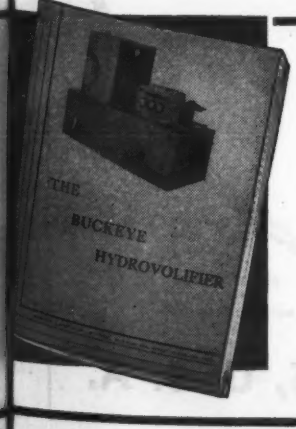


BUCKEYE LABORATORIES CORP.

1965 E. 66TH STREET, CLEVELAND 3, OHIO

GENTLEMEN—
Kindly send me your bulletin containing information on factors affecting performance of insulating oils—how the Hydrovolifier functions—data on its design and construction.

NAME .....

CITY ..... STATE .....

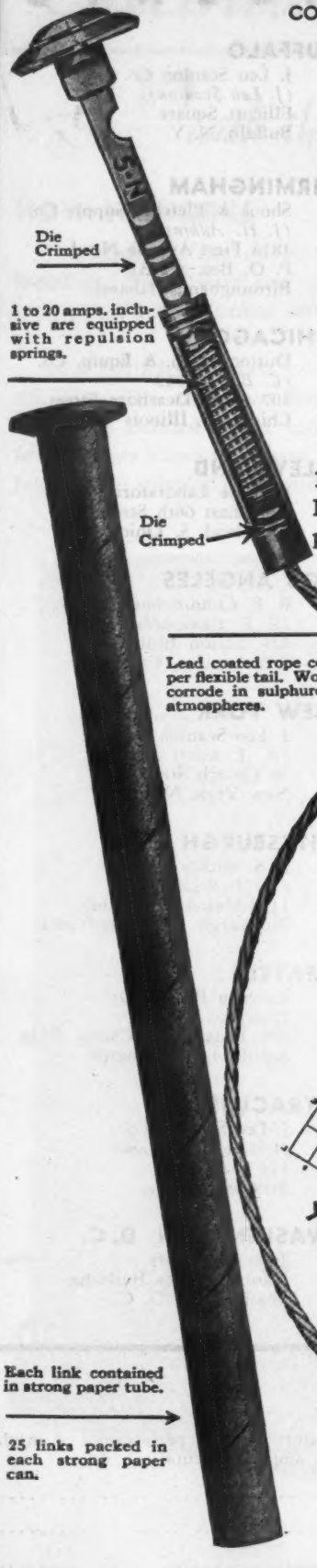
TITLE .....

COMPANY .....

100H UNIVERSAL MATTHEWS FUSE LINKS

COVERED BY PATENTS 1,797,850, 2,067,577 AND PATENTS PENDING

BEST FOR CASCADING


Die Crimped
1 to 20 amps. inclusive are equipped with repulsion springs.
Die Crimped
Lead coated rope copper flexible tail. Won't corrode in sulphurous atmospheres.
Each link contained in strong paper tube.
25 links packed in each strong paper can.

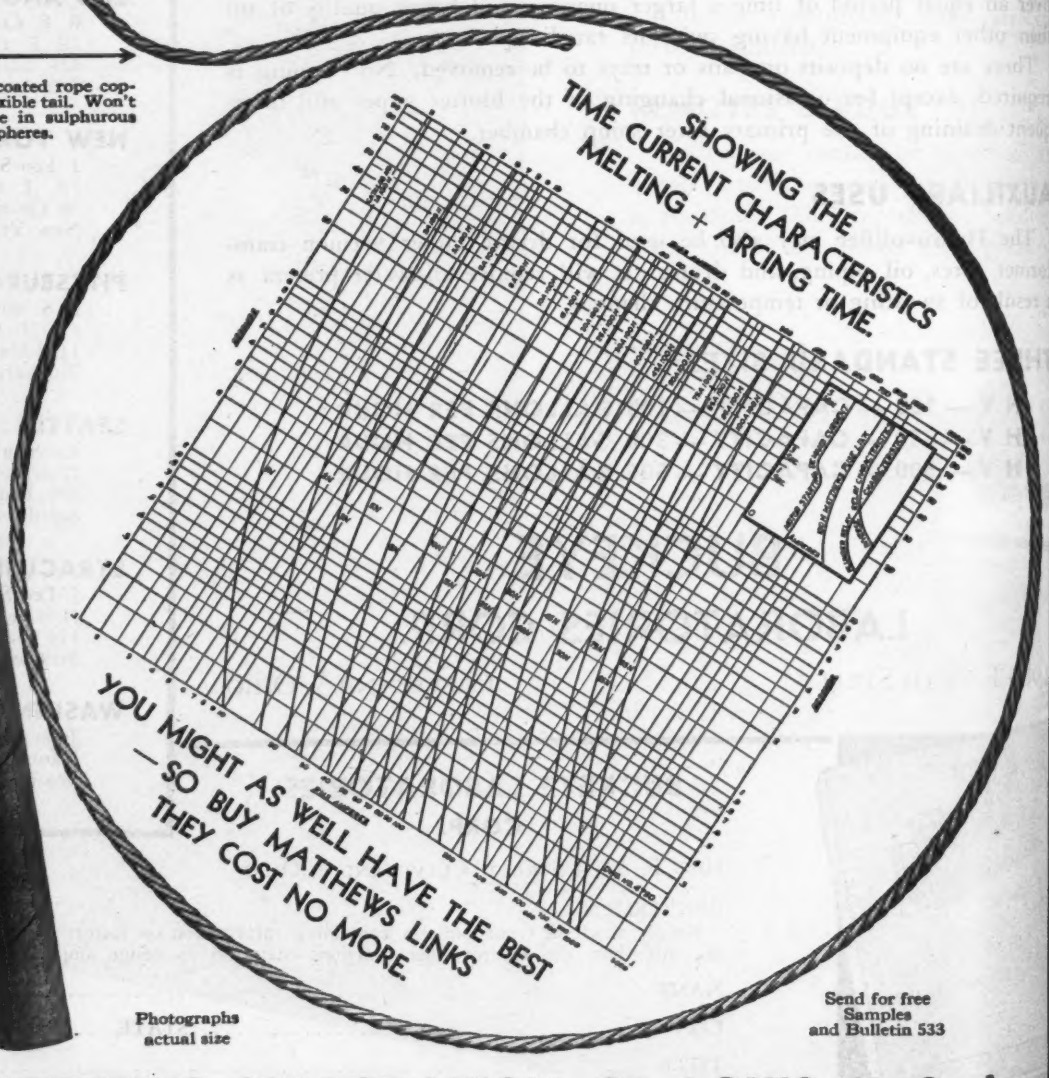
One user of 100-H Links makes it a practice before each lightning season to re-fuse all important cutouts. They claim that this gets rid of all overstressed links and prevents a lot of unnecessary outages and more than justifies its cost. A good way for you to find out that 100-H Matthews Fuse Links are better is to re-fuse some of your more important circuits now and watch the results through the next lightning season.

No solder used in them. Fusing elements are of hard drawn copper. They are mechanically stronger.

Their accuracy is guaranteed to be within 10% + or —.

In addition to the 17 sizes shown on the curves below they are made in ½, 125, 150, 175 and 200 ampere ratings.

Photographs actual size. 100-H shown. 50-H same excepting that it 13 inches overall instead of 20 inches--the wartime length of Universal Fuse Links. (Longer lengths can be furnished, where needed, with WPB permission.)


SHOWING THE TIME CURRENT CHARACTERISTICS MELTING + ARCING TIME.
YOU MIGHT AS WELL HAVE THE BEST —SO BUY MATTHEWS LINKS THEY COST NO MORE.

Photographs actual size

Send for free Samples and Bulletin 533

W. N. MATTHEWS CORPORATION, ST. LOUIS, U. S. A.

IT'S A MATTER OF RECORD!

NO INTELLIGENT ENGINEER is going to be impressed by confusing claims about suspension insulator details. O-B isn't offering you "steam heat and running water" along with "standard equipment." After all, the thing is pretty simple. It is safe to assume that any reputable insulator meets technical requirements. The one big unknown is "How long will it continue to meet them?"

With well over 23,000,000 O-B suspension insulators now in the air, you don't have to go far to unearth facts. These will show a consistent ability of O-B to stay on the job, without trouble, for extended periods of time. This is no claim, it's a matter of record! It's the one point of difference that rules your insulator selection. Just look for "O-B" on the cap.

2497-H

Ohio Brass

MANSFIELD, OHIO, U. S. A.

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

BACK THE ATTACK * BUY MORE WAR BONDS *

In Hot Places Use
Simplex Varnished Cambric Insulated Cables

Simplex Electric Power Cables with varnished cambric insulation may be just what you need for power transmission under certain conditions where other standard insulations are inadequate or undesirable.

They can operate safely at high temperatures (to 85°C at 5000 VWP or less.) making them particularly desirable for central station or power house wiring and for mill or factory distribution systems. Jointing and terminating are simple operations.

The varnished cambric insulation is not affected by exposure to oil; the cables are being used for transformer and oil switch leads with entire success. The filling compound is carefully selected for its non-migrating, non-hardening, lubricating properties. Outside coverings - lead, armor or braid - are provided to meet operating requirements.

Simplex varnished cambric cables may be just what you need to obtain permanent, satisfactory distribution in some difficult location. They are easy to handle, easy to install and easy to maintain.

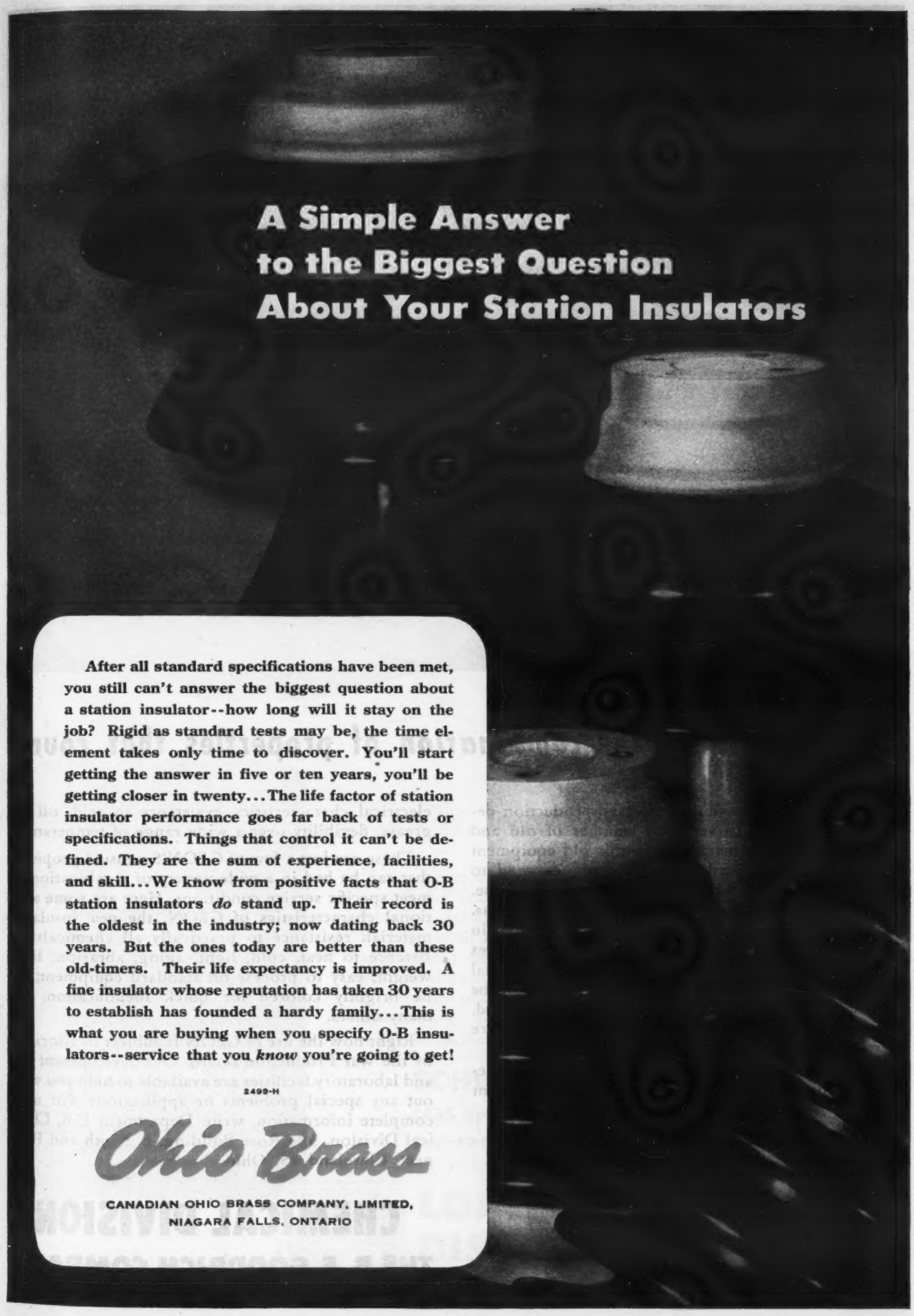
Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

ARMY E NAVY

M★★★

Simplex

WIRES and CABLES

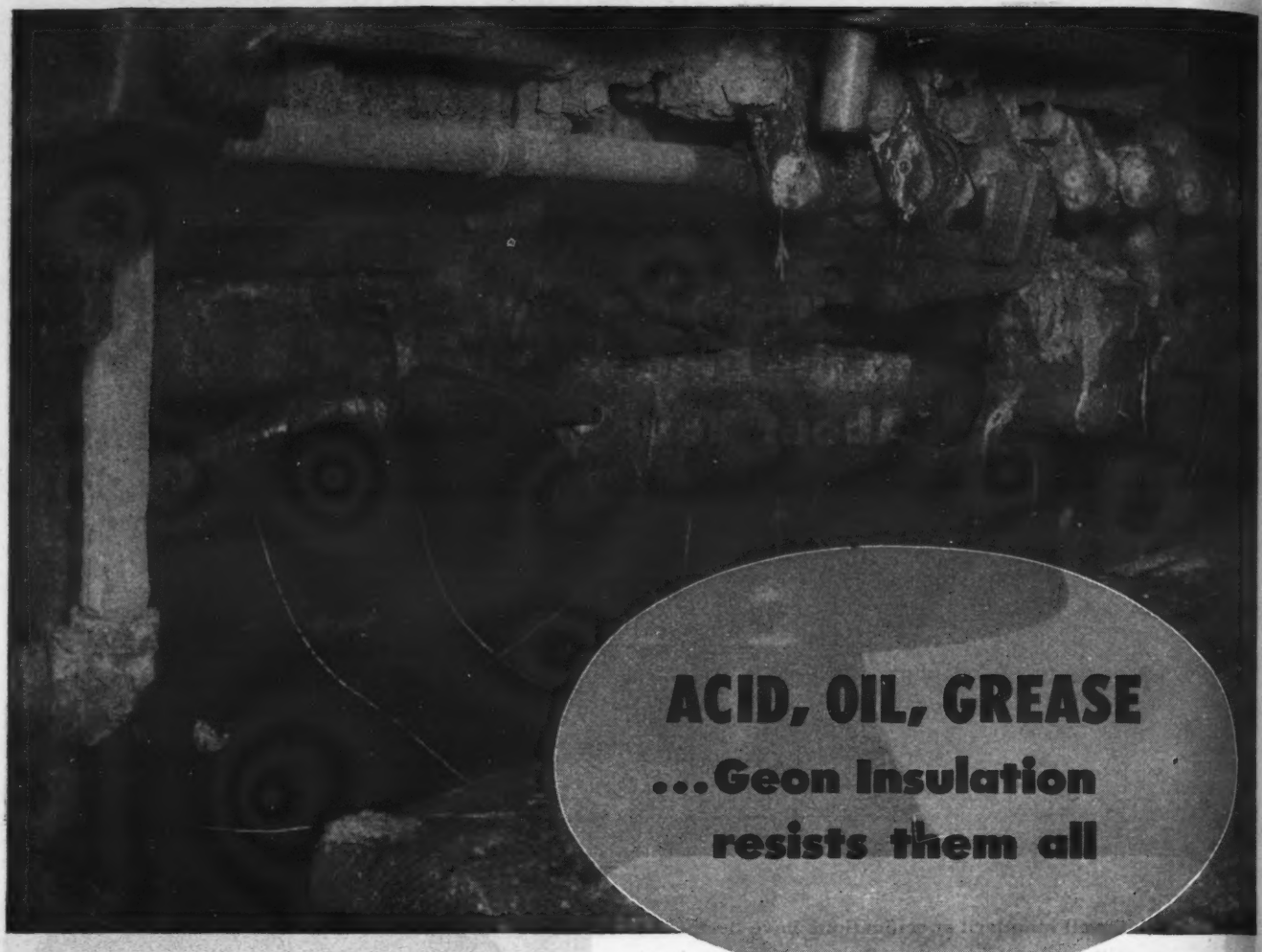


After all standard specifications have been met, you still can't answer the biggest question about a station insulator--how long will it stay on the job? Rigid as standard tests may be, the time element takes only time to discover. You'll start getting the answer in five or ten years, you'll be getting closer in twenty... The life factor of station insulator performance goes far back of tests or specifications. Things that control it can't be defined. They are the sum of experience, facilities, and skill... We know from positive facts that O-B station insulators *do* stand up. Their record is the oldest in the industry; now dating back 30 years. But the ones today are better than these old-timers. Their life expectancy is improved. A fine insulator whose reputation has taken 30 years to establish has founded a hardy family... This is what you are buying when you specify O-B insulators--service that you *know* you're going to get!

2490-H

Ohio Brass

CANADIAN OHIO BRASS COMPANY, LIMITED,
NIAGARA FALLS, ONTARIO



With Geon it's the *combination* of properties that counts

IN an Eastern rayon mill, increased production demands returned to service a number of old and outmoded spinning machines. In this old equipment the electric motor leads are constantly exposed to 10% sulphuric acid fumes as well as oil and grease. The photograph gives some idea of the conditions. And just to make it harder, spare leads are stored in an unheated warehouse where winter temperatures go well below zero. Ordinary wire insulation material might do the job. But frequent shutdowns would be necessary to change the leads as they deteriorated. And shutdowns had to be avoided if production were to stay up.

So—GEON was selected because GEON could deliver the needed *combination* of properties: excellent electrical characteristics, resistance to acid, oil and grease, flexibility over a wide range of temperatures.

These are just a few of GEON'S unusual properties that can be had in a wide variety of combinations to meet specific service conditions. Here are some additional characteristics of GEON, the *new* insulation material: resistance to practically all chemicals; resistance to heat, cold, light, aging, abrasion; lightweight; easy to process on standard equipment; can be brightly colored for quick identification; and many others.

Right now the use of GEON is subject to allocation by the War Production Board. Our development staff and laboratory facilities are available to help you work out any special problems or applications. For more complete information, write Department C-6, Chemical Division, 324 Rose Building, E. Ninth and Prospect, Cleveland 15, Ohio.

Geon
Vinyl Resins & Plastics

CHEMICAL DIVISION
THE B. F. GOODRICH COMPANY
ROSE BUILDING, E. NINTH & PROSPECT, CLEVELAND 15, OHIO

THIS IS THE TREND

15KV S & C Load Interrupter Switch and Power Fuse in steel cabinet, providing load switching also short-circuit protection of 25000 amps. r.m.s. on a 13.2KV circuit. Switch is group operated from exterior of cabinet.

The new Interrupter Unit clears circuit in cycle or less

The opening movement of the switch blade actuates the Load Interrupter Unit mechanism separating the Interrupter terminals at high speed and interrupts the load without drawing any arc between line contacts of the Disconnect Switch.

Today power company customer installations are being made with S & C Load Interrupter Disconnect and Power Fuse Combinations. Enclosed in steel cabinets, they occupy little space, are easy to install and maintain—yet provide thoroughly reliable short-circuit protection and *switching under load conditions* without drawing an arc external to the switch contacts.

They are made in ratings to 400 amperes, 7.5 KV and 15 KV. Consult your nearest S & C sales engineer for detail data,—or write for Bulletin 202-A.

SCHWEITZER & CONRAD, INC.

4435 Ravenswood Ave., Chicago 40, U. S. A.

Supplied in Canada through Powerlite Devices, Ltd., Toronto, Ont.

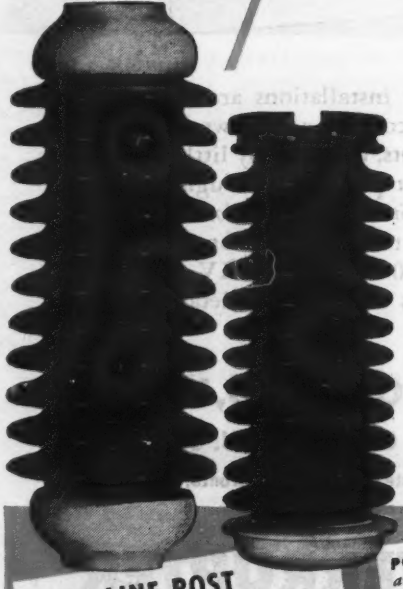
LOAD INTERRUPTER DISCONNECT SWITCH and FUSE COMBINATION

LINE CONVERSION WITH LAPP LINE POSTS

is the fastest way to fortify your system....

and uses least materials

New or increased load demands frequently can most efficiently be handled by conversion of existing lines to higher voltage. For this job, Lapp Line Posts are particularly suited. Using present sound poles and conductors, conversion to higher voltages can be accomplished with no more than new cross-arms and Lapp Line Posts. Nor need such construction be considered as an emergency temporary expedient. Such a line approaches the current ideal for a new line; and your Lapp Posts can be expected to give trouble-free service for a longer period of years than you ever got from conventional insulators.



Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, N. Y.

LAPP LINE POST and STATION POSTS on your system offer..

POWER ARCOVER. *Flashover and leakage distances are not appreciably lowered by damage —even loss of several petticoats.*

NO PUNCTURE. *Puncture path in Lapp Post design is as great as flashover path. Insulator will flash over rather than puncture.*

NO CRACKING. *One piece post body, not subject to bursting from tension strains created by thermal changes in nested parts.*

RADIO INTERFERENCE. *By virtue of design factors alone, radio interference is permanently prevented at rated neutral voltage.*

NO CLEANING. *Fog-type design preserves uniform leakage path, prevents leakage flashover, makes the unit "self-cleaning."*

MECHANICAL RUGGEDNESS. *Stones or bullets deflect off, or rupture petticoats, leaving post body intact and insulator secure.*

DATA SHEET

KEARNEY

POWER LINE CONSTRUCTION MAINTENANCE and PROTECTIVE EQUIPMENT

FOR TRANSMISSION AND DISTRIBUTION SYSTEMS

A representative assortment of Kearney equipment is shown in these pages as typical of the many devices that have lead the way to lower construction costs and more efficient operation.

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

The Mark of Quality Products

JAMES R. KEARNEY CORPORATION

Designers and Manufacturers of Overhead and Underground Utility Equipment

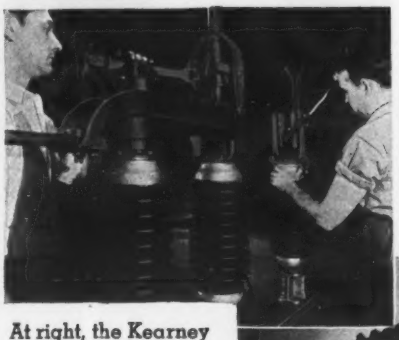
4224-42 CLAYTON AVE. ST. LOUIS, (10) MISSOURI

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

THE MARK OF QUALITY PRODUCTS

GANG OPERATED DISCONNECTS

Sturdy construction is an essential which has been incorporated into Kearney Gang Operated Disconnect Switches, along with other features such as point pressure contacts and sleet breaking design.



At left, vertical break Kearney Rotating Insulator Type Gang Operated Disconnect Switch. These sturdy switches are available in voltages from 7500 volts up to 115,000 volts; 400, 600 and 1200 amperes.

At right, the Kearney Rocker Type Gang Operated Switch that has point pressure contacts and point pressure pantograph that eliminates possibilities of troubles with cable at this point.

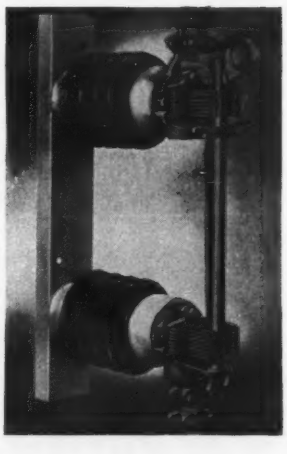
TRIP-O-MATIC FUSE CUTOUTS

A widely-used cutout that gives visual indication when an outage occurs.

It is an improved design that uses the approved Kearney trip-action principle built into a closed housing of high grade wet process porcelain. A Bakelite door and the fuse cartridge are a single unit which "trips out" of the housing when a fault occurs, clears the circuit, gives visual indication of the outage and de-energizes the cartridge. Ratings 5 and 7.5 KV—50 and 100 amperes.

HOOK OPERATED DISCONNECTS

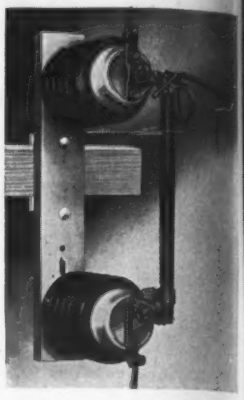
Kearney N. E. M. A. Hook Operated Disconnect Switches are available in ratings of 7500 through 46,000 volts, 200, 400 and 600 amperes, and also 46,000 volts to 69,000, 600 and 1200 amperes. Multi-point pressure contacts, station post insulators and tubular blades are standard; shoe-type contacts pin and cap insulators and truss-type blades, optional. Terminals can be supplied for use on cable, flat bus or tubing. See Kearney Bulletin 312 for details.

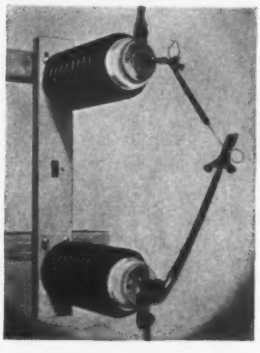


The OPEN-TYPE FUSE CUTOUTS

The popular Trip-Out Switches, available in ratings: 100 and 200 amperes, 5000, through 46,000 volts, and the 100 ampere 69,000 volt Trip-Out. The widely used, inexpensive Trip-O-Link Fuse Switch is available in ratings: 50, 75 and 100 amperes, 5000 through 69,000 volts. Both types are time-tested, guaranteed products. Point pressure contacts are a design feature of these modern switches.

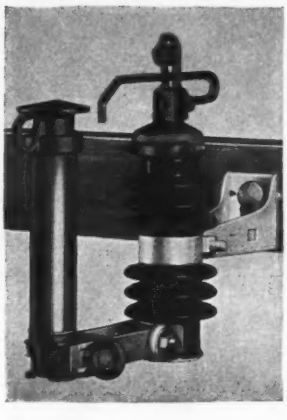
Illustrated at right is 100 ampere Kearney Trip-Out Fuse Switch, featuring point pressure contacts.





Kearney Trip-O-Link Fuse Switches, such as the 15,000 volt type shown, have flash-over values and interrupting capacities in accordance with N. E. M. A. Specifications SG9-20 for cutouts rated 50 amperes.

KEARNEY LIGHTNING ARRESTERS



Type P Lightning Arresters, having the Expulsion Tube Gap principle, have impulse ratings of 41,200 amperes and a follow current rating of 3000 amperes. This Kearney Arrester is recommended where line to ground short circuit current is of relatively high value.

KEARNEY FUSE LINKS

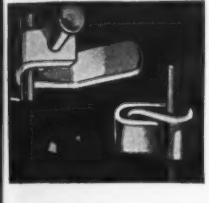
Kearney Fuse Links are designed for use in cutouts which require a flat terminal fuse link, and in cutouts which require the round button. Links come packed in handy Pul-Tab Paks providing quick identification and convenience. There are five fuse links in each Pul-Tab Fuse-Pak, twenty-five links in a carton.

KEARNEY ACCESSORIES

GROUND RESISTANCE METERS

The No. 12170 Kearney Ground Resistance Meter is a precision instrument which accurately measures ground resistances. It is a direct reading instrument—no ear phones to bother with, no bridge circuits to balance, nothing to adjust. The three range of resistance are 0-20, 0-200 and 0-2000. These resistance meters have been moderately priced.

GROUND WIRE CLIPS



Ground Wire Clip shown, is the means by which operating men have eliminated radio interference troubles formerly caused when loosening of ordinary staples caused static discharge to the ground wire. As shown in the accompanying illustration, they securely hold the ground wire, regardless of temperature changes or vibration.

2-WAY EXPANSION ANCHORS

Select No. 8120 Expansion Anchor for holding power of as much as 10,500 pounds in ordinary soil up to 14,000 pounds in clay. Other sizes of anchors have similar security. Blades expand 2½ times their rated size and have up to 63% of their area in firm, undisturbed earth. A heavy disc, reinforced with ribs, is provided with a recessed socket for the nut that permits salvaging of the rod. Made of Certified Specification Malleable Iron.

TOOLS AVAILABLE FOR 6900 VOLTS TO 220,000 VOLTS

KEARNEY Hi-Line tools are unusually flexible in their use. With even the few tools pictured in the illustrations many maintenance jobs can be performed. Typical of the more commonly used tools are those listed and shown below. Questions on your live line maintenance problems are invited.

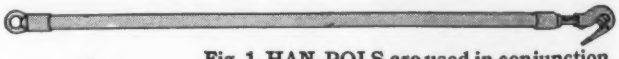


Fig. 1. HAN-POLS are used in conjunction with LIFT-POLS to manipulate live conductors. Also for holding under arm jumpers at a safe distance from the lineman.

Fig. 2. INSULATED PLIERS OR CUTTERS are available on 1¼ and 1½ inch diameter laminated oak handles, tested to 75,000 volts per foot. The insulated handles will accommodate heavy duty cutters, and either 8 or 9 inch side cutting pliers or gas pliers.

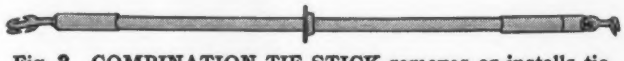


Fig. 3. COMBINATION TIE STICK removes or installs tie wires. Blade-Type Sticks with Prong-Type Heads on lower end.

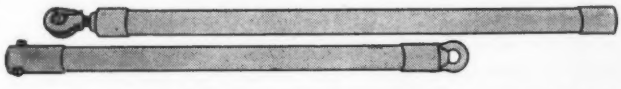


Fig. 4. LIFT-POLS are used for moving and supporting live conductors. Made of laminated spruce, 2, 2½ and 3 inch diameters, lengths up to 14 foot. Splices are available for any size LIFT-POLS.

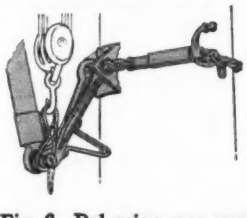
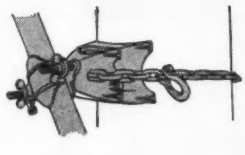


Fig. 5. The LIFT-POL-Lever is used similarly to the large Pol-Grips. However, it is attached to the swivel eye on the end of the LIFT-POLS when in use. Has sufficient travel to transfer conductor from pole pin position over the end of a ten-foot standard line arm.

Fig. 6. Pol-grips are used to guide and hold in position lift-pols and han-poles. Pol-grip-extensions are a means of off-setting one pol-grip from another, allowing LIFT-POLS or HAN-POLS to pass when it is necessary to install the grips in close quarters.



FOR JUMPERING, GROUNDING AND TAPPING

No. 4767 Jumper Clamps for by-passing equipment.

Spring Type Grounding Clusters No. 7402 are shown at right.

Clamp handles from No. 6 solid copper to 1500 MCM, stranded, maximum.

Kearney No. 3519 Series—Spring Type Con-Nec-Tap Clamps.

OTHER KEARNEY PRODUCTS

Trip-O-Disconnect Switches, Rotating Insulator Gang Switches, Sectionalizing Cutouts, By-Pass Disconnect Switches, Porcelain Housed Disconnect Switches, Secondary Fuses, Fuse Pullers, Full-Vu Guy Guards, Guy Wire Clips and Strand Bands, Sleeve Twisters and Dies, Dead-End Service Clamps, Fit-Rite Wire Holders, "T" Con-Nec-Tites, Bus Bar Fittings, Con-Nec-Tap Clamps, Telephone Accessories.

Write for Information and Prices

JAMES R. KEARNEY CORPORATION

4224-42 CLAYTON AVE. ST. LOUIS, (10) MISSOURI

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

THE MARK OF QUALITY PRODUCTS

CON-NEC-TITES
for Making Electrical Connections

Make good, positive, electrical connections. These widely known Con-Nec-Tites are available in sizes to make any size wire connection, from No. 10 stranded up to 1,000,000 CM Copper. You'll like the "hex" heads, uniform threads, sturdy design and other features of these popular solderless wire connectors.

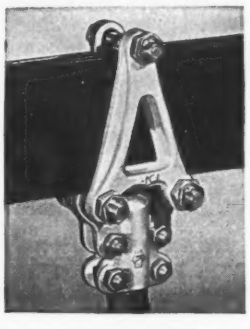
LAP-TITES
for Making Electrical Connections

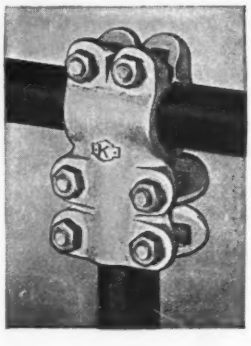
Wire sizes 10 to 4 stranded

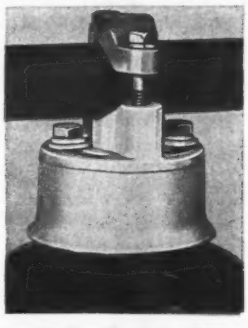
The Kearney Lap-Tite is a sturdy, solderless connector built especially to make quick, safe house service or other similar connections. The body is made of cold drawn compressed copper — screws are made of Duronze. The Kearney Lap-Tite is made in three sizes to handle a wide range of wire sizes.

POWER CONNECTORS *and* BUS SUPPORT FITTINGS
For the Building of Better Substations

The Kearney Branch Connector, Flat to Cable Tee Adapter, shown at left, can be supplied in any standard size. Likewise, the Tube to Tube Tee are available for all standard size combinations. These power connectors and the others shown in the Kearney Bulletin No. 316, are modernly designed and sturdily built to meet the requirements for handling today's increasing loads. Special power connectors for particular purposes may also be obtained. The alloys used in each of these types of connectors have been selected to combine desirable conductivity, strength, corrosion resistance and low friction. All of these are factors of dependable performance. This entire line is backed by the Kearney guarantee of complete satisfaction.



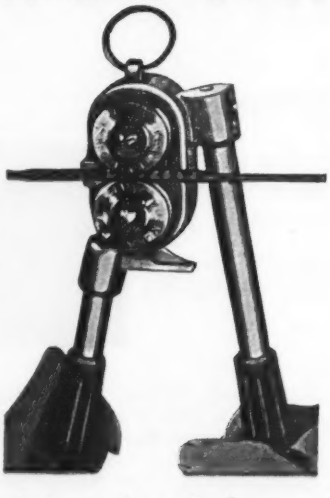




Shown, at the top, is Kearney Flat Bar Bus Support Fitting, Center Bolt Base Vertical Clamp. Below is an outdoor type, Round Bus Support Fitting, 3-inch Bolt Circle Base Vee Seat for round, solid, or tubular bus. Besides the fittings here shown, there are available in the Kearney line special and unusual types which may help to simplify unusual construction problems. Numerous combinations, in many cases, can often be made with interchangeable standard parts. To simplify your problems of outdoor and indoor insulator support choices and to obtain the proper types for specific jobs, start specifying Kearney, now.

SEND FOR BULLETIN 316 SHOWING KEARNEY COMPLETE LINE OF SUBSTATION FITTINGS

A-B-C SPLICING MACHINE *and* SLEEVES
for Making a Better Splice



For conserving wire and making good, secure splices every time, use a Kearney ABC Machine to roll sleeves onto conductors to be joined.

THE PRINCIPLE — Under tremendous pressure, ABC Sleeves are rolled onto conductors.

An ABC sleeve before it is rolled.

The same sleeve after it was rolled.

The raised spiral corrugations on the sleeves (note illustration below) are rolled down into the conductor and thus form a tight, compact joint of strength equal to the breaking point of the wire itself. Shown here is the popular moderately priced Kearney No. 6-1 ABC Rolling Machine.

Write for Information and Prices

JAMES R. KEARNEY CORPORATION
4224-42 CLAYTON AVE. ST. LOUIS, (10) MISSOURI

a few years make a *difference...*

you'll need modern meters ...*for tomorrow's loads*

AT the Museum of Science and Industry in Chicago, one of the most popular exhibits is a small power plant, a typical installation of about 1907. Most of the equipment is still as good as when it was built—BUT NOT AS GOOD AS THAT BUILT TODAY. There is a lesson about meters in this! Meters which have nothing wrong with them mechanically, may still be too far behing the times in design to record the *modern load* flowing into modern homes.

When electrical appliances are again available, when vast numbers of homes are being built with wiring and outlets planned for labor-saving and comfort-giving devices of every description, Duncan Meters will enable you *to meter modern* loads correctly.

Duncan meters feature: Straight Line Accuracy up to 400% Rated Load; Alnico Damping Magnet; Porcelain Terminal Blocks; Nobeloy Lifetime Bearings; Micro-set Adjustments and Layer-on-Layer Construction.

DUNCAN ELECTRIC MFG. CO.

Lafayette **Indiana**

DUNCAN

WATTHOUR METERS

...makers of precision watthour meters for over forty years

then he thought to himself

"WHY WAIT 'TIL YOU'RE CORNERED?"

AT his recent reception in Washington, General DeGaulle and General Pershing were deploring the havoc of the war and hoping some good might result. DeGaulle remarked that perhaps Mahomet had something when he ventured the statement:

"Without war, the world would be in a condition of stagnation."

It is a sad commentary on human inertia that men must wait until the gun is jabbed in their ribs before they will stir themselves to great effort.

But it seems a fact that men usually wait for a crisis before they get bold and take hurried recourse to the best means for liberation.

Even today, some business men are waiting for the pointed guns of competition before taking action. And others . . .

"WHY WAIT 'TIL YOU'RE CORNERED?" *he says*

LOOK, GENERAL, how some are beating the gun of competition through recourse to the Lincoln "Shield-Arc" Welder:

Gun Beater: THE "SHIELD-ARC" WELDER

Gives you top quality welds at highest speed because its Job Selector enables you to select the right TYPE of arc to suit the job . . .

Its Dual Continuous Control covers the widest possible range . . . for thin sheets to heaviest plates . . .

Self-protected against burnout, the "Shield-Arc" can be used to "beat the gun" with larger electrodes for sustained operation.

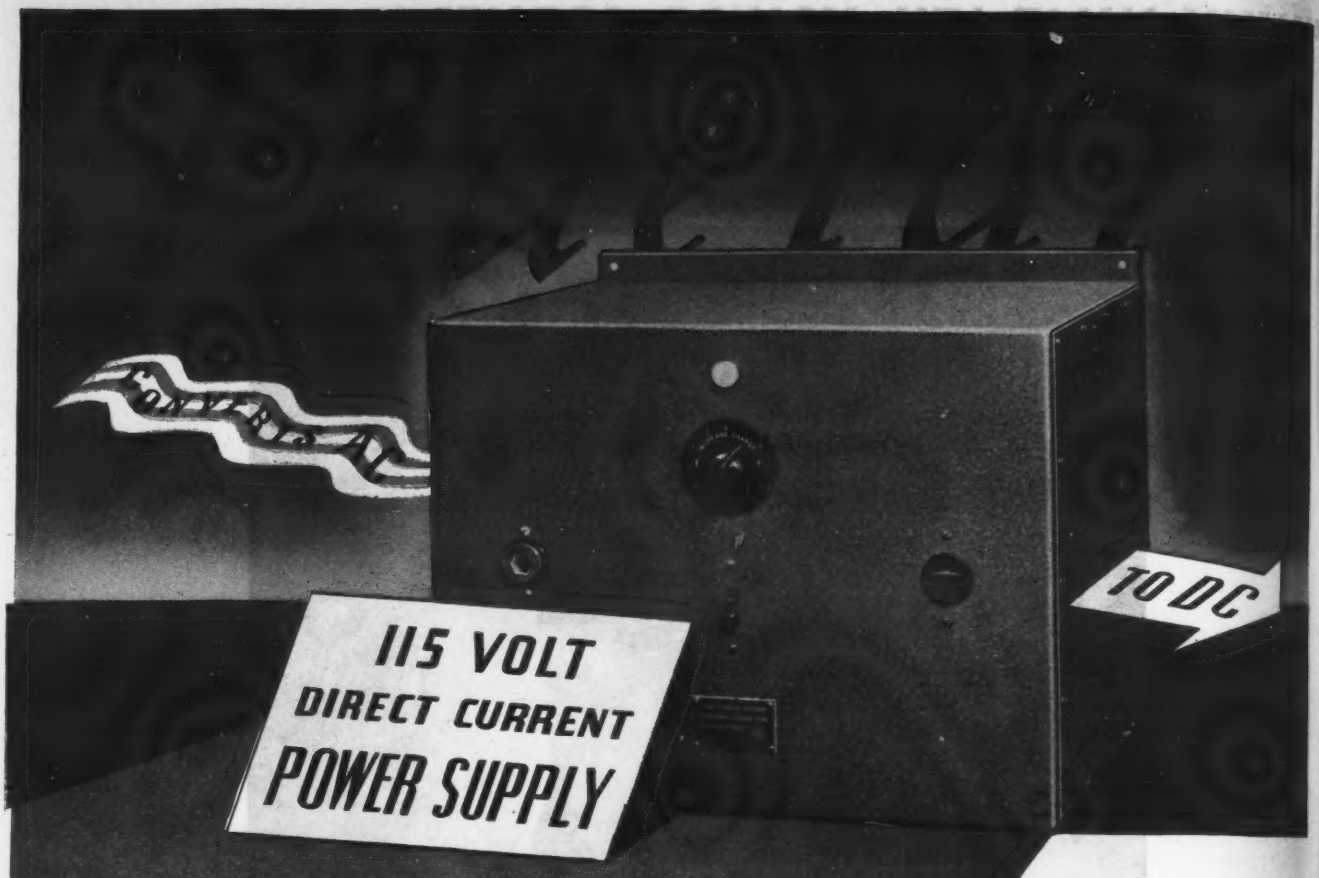
The full story is given in Bul. 412. Free on request.

THE LINCOLN ELECTRIC COMPANY • Cleveland 1, Ohio

Another LINCOLN *Contribution to . . .*

America's greatest natural recourse

ARC WELDING



FEDERAL POWER EQUIPMENT—well known for long dependable life, low cost, and high efficiency . . . made in a wide range of sizes and outputs . . . for any DC need from any AC source.

- **PUBLIC UTILITIES**—for station DC bus service, floating storage batteries and operating controls.
- **CHEMICAL AND METALLURGICAL**—DC power for refining, electroplating, electro-cleaning and laboratory analysis.
- **METALWORKING**—for operating magnetic equipment such as grinders, chucks, lifts and vibrating hammers.
- **FOOD AND DRUGS**—for magnetic separators, operating packaging equipment and power supply for processing.
- **INDUSTRIAL PLANTS**—for DC motor operation, electric brakes, general testing and generator field excitation.

★

Federal's exclusive CENTER CONTACT Selenium Rectifier discs provide new protection against corrosive atmosphere, are now in Federal Power Supply equipment. FIRST IN THE FIELD . . . . STANDARD FOR INDUSTRY. *Write for Bulletins.*

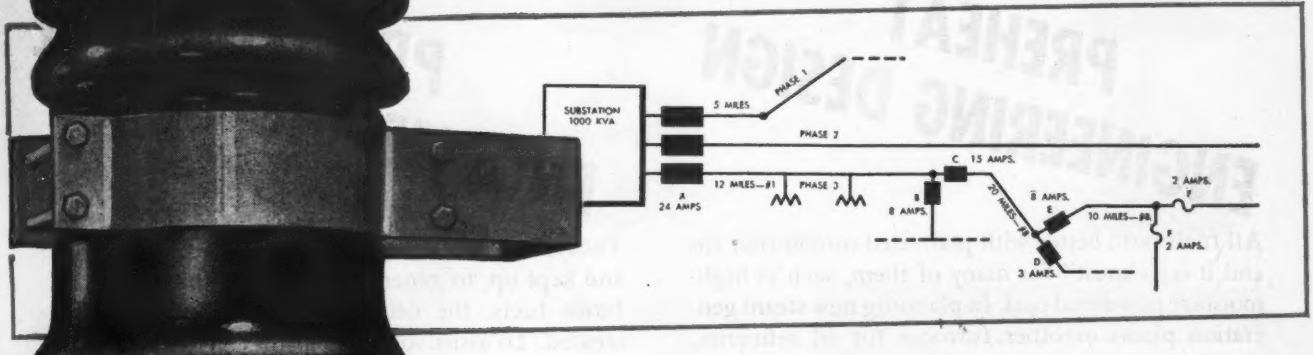
Federal Telephone and Radio Corporation

ISOLATE FAULTS

ON RURAL LINES

. . . by accurately co-ordinated circuit protection with the new

Westinghouse AR-I Automatic Recloser



Over 80% of all faults are of a *temporary* nature. Westinghouse engineers have utilized this fact—with the result that the great majority of rural line outages and service trips are now unnecessary! They have developed the Westinghouse AR-1 Automatic Recloser which discriminates between permanent and temporary faults!

The recloser interrupts *all* faults—but recloses and restores service on temporary faults. On permanent faults, it locks out and must be reset by hookstick.

Time-lag tripping permits accurate co-ordination with other reclosers and with standard fuses. Length of line out of service is reduced to an absolute minimum.

Data telling you how to select and co-ordinate the recloser with other circuit protection are now available in book form. Write for your copy of B-3329. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania, Dept. 7-N. J-60545

TIME-LAG TRIPPING

PERMITS

- Co-ordinating reclosers with each other and with fuses
- Burning faults clear and restoring service
- Energizing line after lock-out without by-pass switch

PREVENTS

- Simultaneous tripping of reclosers
- Unnecessary tripping on momentary overloads
- Chattering
- Tripping of immediate and preceding reclosers when re-energizing line

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

AR-I RECLOSERS

2 WAYS TO IMPROVE COMBUSTION *whatever your fuel*

PREHEAT ENGINEERING DESIGN

All fuels burn better with preheated combustion air, and it is a "must" for many of them, such as high-moisture powdered coal. In planning new steam generation plants or other furnaces for oil refineries, chemical plants, etc., remember that the *continuous regenerative counterflow* principle of the Ljungstrom Air Preheater assures maximum heat transfer with minimum weight and size. Flexible and compact, it may be used in a wide range of applications. With the Ljungstrom it is possible to obtain preheated air up to 1500 deg. F.

All boiler manufacturers can furnish you designs incorporating the Ljungstrom Air Preheater. Or, the engineering staff of The Air Preheater Corporation is prepared to assist you, your consulting engineers or your boiler company, in applying standard or special types of Ljungstrom Preheaters to your fuel conservation needs. Our engineers are ready to work with yours to help you make better use of low-grade, more abundant fuels and to help you plan for future modernization of, and additions to, your steam generating plants.

PREHEAT ENGINEERING SERVICE

Today, when boiler efficiency must be stepped up, and kept up, to generate steam with the current inferior fuels, the need for expert service has increased. To assist you in securing efficient operation under abnormal conditions, The Air Preheater Corporation has expanded its service facilities, so that an Air Preheater Service Engineer, whose sole responsibility is Ljungstrom Preheaters, is quickly available to keep your Ljungstrom operating smoothly, and at peak efficiency.

NEW! When, for reasons of fuel conservation Ljungstrom Preheaters are operated with lower gas exit temperatures than those for which they were designed, deposits sometimes form. To do an even better job of removing these deposits, a new, single-nozzle cleaning device is available for immediate installation on *all* Ljungstroms. Full details will be sent upon request.

THE

AIR PREHEATER

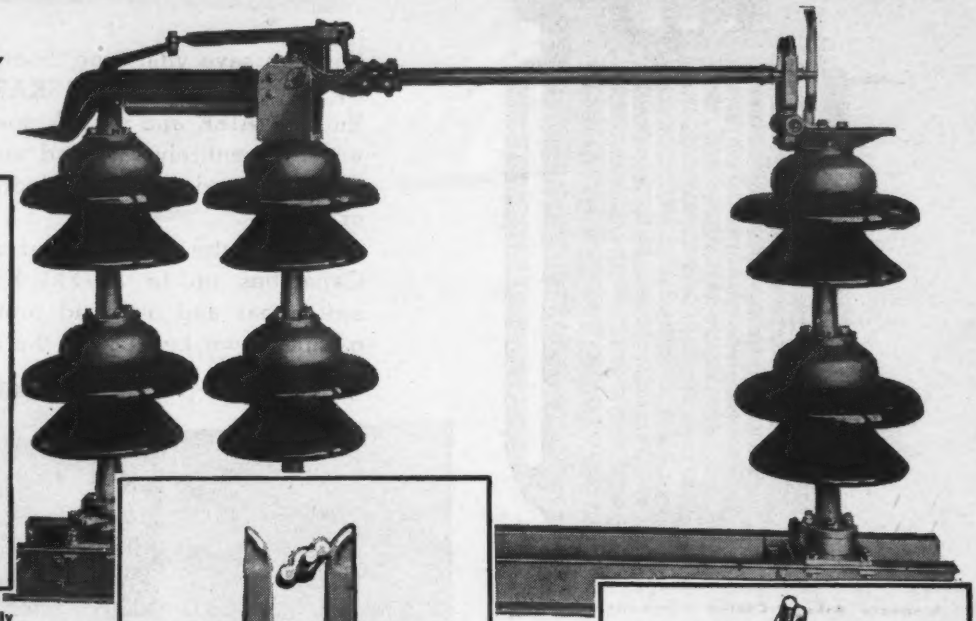
CORPORATION

Executive Offices: 60 East 42nd Street, New York 17, N. Y. • Plant: Wellsville, New York

You can OPEN this Switch under HEAVY ICE CONDITIONS

BECAUSE IT
PROGRESSIVELY
FRACTURES ICE

1 Closed position. Blade rotated to apply contact pressure. Strong springs apply full pressure over a wide range of contact deflections.



2 Switch blade rotates to fracture any ice on contact and to release contact pressure.

3 Blade in partial open position. Arcing horn not shown.

PACIFIC ELECTRIC
Switch
TYPE TW

7.5 kv. to 229 kv.

Here is a switch designed so that all operating parts move and *progressively* fracture as much as 2-inches of ice. This progressive fracturing of ice starts with the operating handle, through the bevel-link drive to the switch contact.

Yes, it's a design that permits the operator to free *the mechanism from ice* before the opening or closing movement of the switch blade.

The contact pressure is then released by the rotation of the switch blade, permitting easy opening under the most extreme ice conditions.

Other features are the contact springs which assure full contact pressure over a wide range of contact deflections; the easy installation and adjustment of the switch with its two adjustments, one for positioning the blade and one for the rotation of the blade.

Ask for details—about the NEMA Standards—how it is a safe and positive switch for important substation use.

C. H. CUTTER
1015 Securities Bldg.
Seattle 1, Wash.

G. B. KIRKWOOD
437 S. Hill St.
Los Angeles 13, Calif.

A. A. MARRS
526 Dwight Bldg.
Kansas City 6, Mo.

J. E. REDMOND CO.
448 W. Madison St.
Phoenix, Ariz.

F. W. GORMAN
P. O. Box 223
El Paso, Texas

R. ACKERMAN
318 Deely Block
Salt Lake City 1, Utah

Other Representatives in Principal Cities

Pacific Electric Mfg. Corporation

5815 THIRD ST., SAN FRANCISCO 24, CALIF. P. O. BOX 419, GARY, INDIANA

THE ANSWER TO MANY OF

Standard

TRADE MARK

You can save vital time, floor space and installation cost by specifying Standard ASKAREL-COOLED Transformers. Built to AIEE and NEMA specifications, these Standard units are entirely safe and approved for use up to rated capacities indoors or outdoors without separate housing or vaults.

Some of the more popular designs are illustrated here. Capacities up to 10,000 Kva are available. Built-in switchgear and overload protection is a feature rapidly gaining favor because of the economies effected.

Standard Askarel-Cooled distribution transformer, 250 Kva, 2300. 115 230 volt, single phase, 60 cycle.

By locating this distribution transformer near the load center, costly runs of low-voltage wiring are saved. Many Standard Transformers are now furnished with switching equipment installed in an attached cabinet as shown above. Being Askarel-Cooled, it is safe anywhere.

Design typical of ratings up to 50 Kva inclusive. High and low voltage terminals can be arranged for housing with switch and fuses as specified.

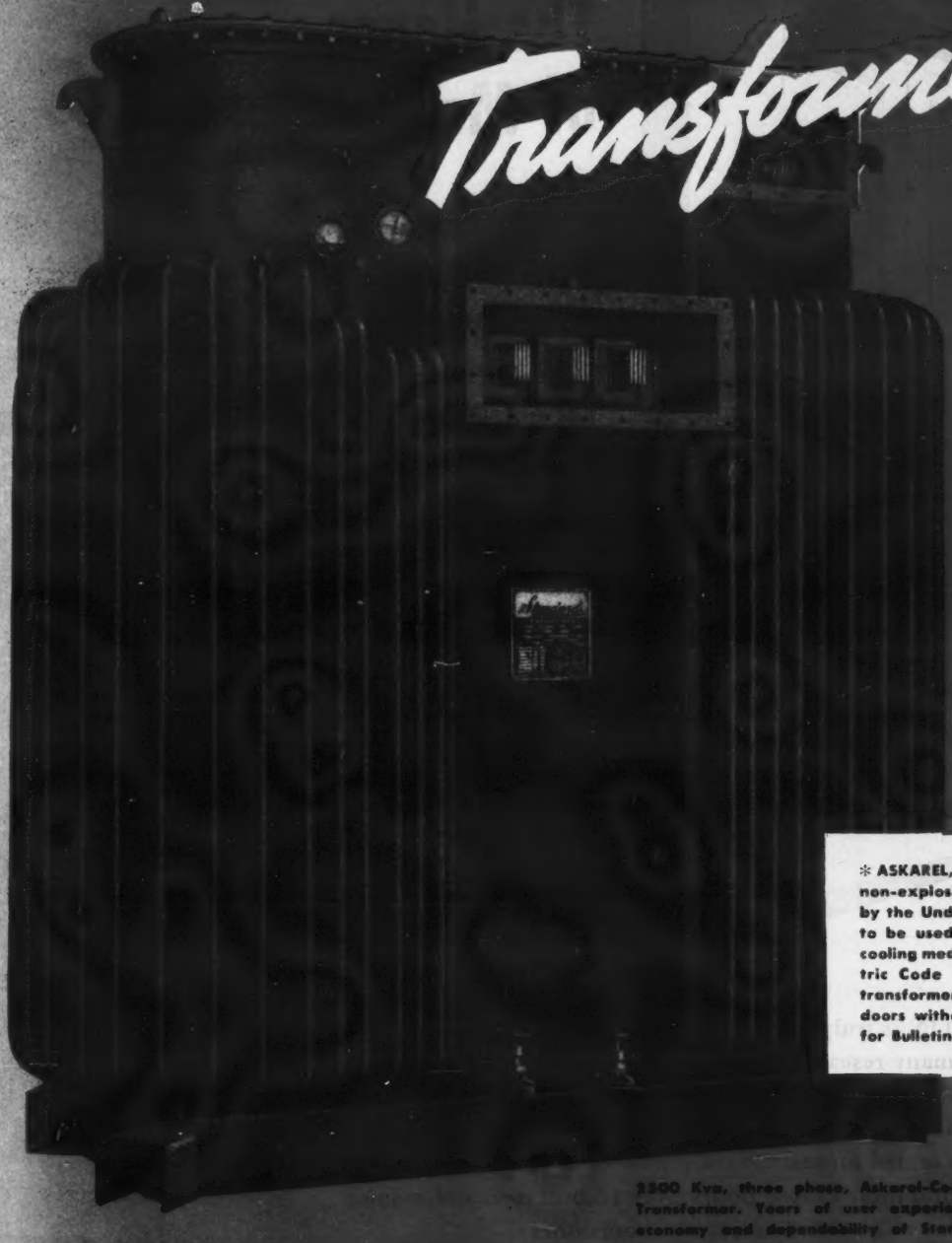
For Every Class of Service **THE STANDARD T**

Makers of: POWER, DISTRIBUTION, RURAL, INSTRUMENT, STREET LIGH

YOUR INSTALLATION PROBLEMS

ASKAREL*-COOLED

Transformers

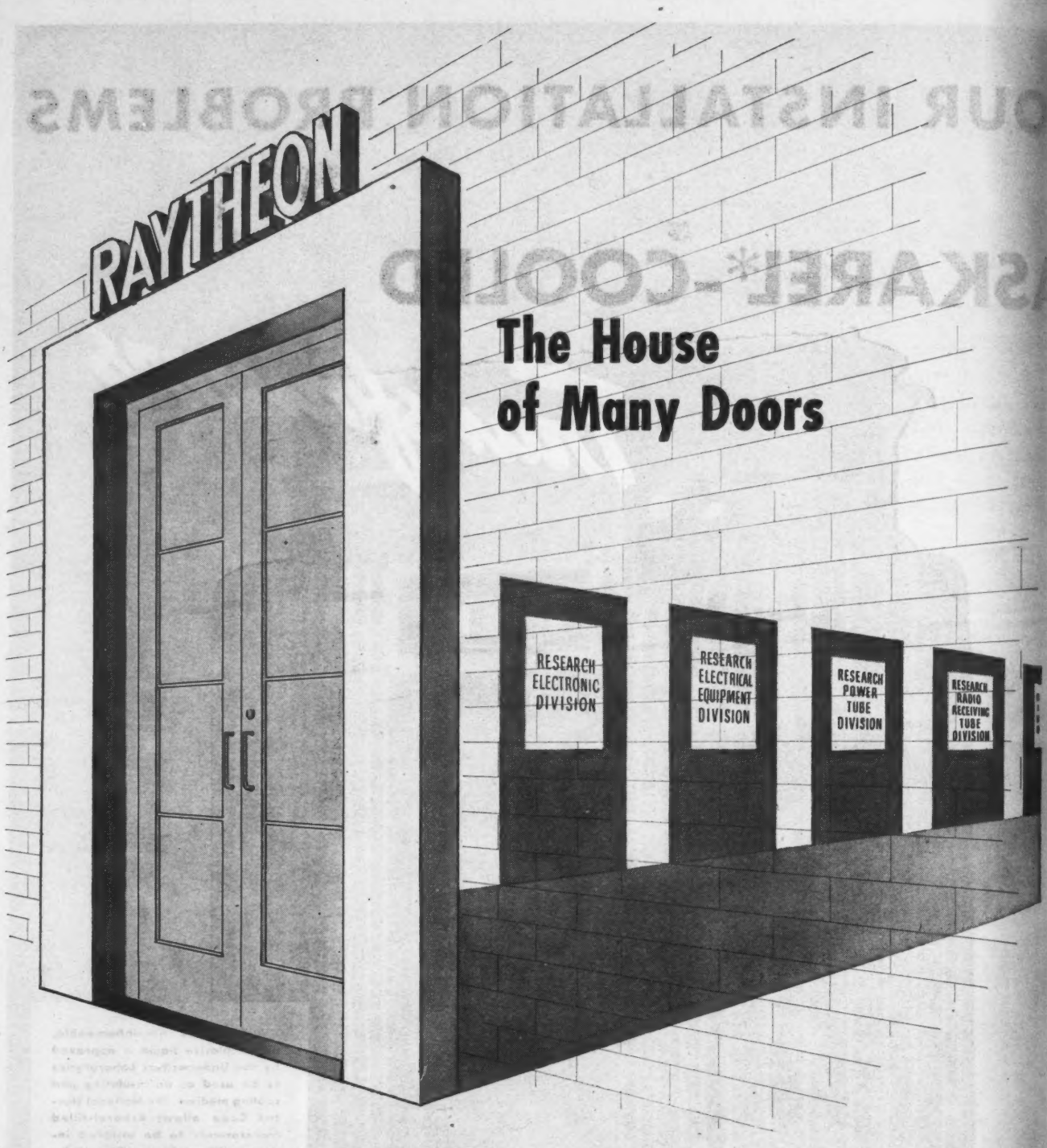


*ASKAREL, a non-inflammable, non-explosive liquid is approved by the Underwriters Laboratories to be used as an insulating and cooling medium. The National Electric Code allows Askarel-filled transformers to be installed indoors without fireproofing. Write for Bulletin S-101.

2500 Kva, three phase, Askarel-Cooled Standard Power Transformer. Years of user experience has proved the economy and dependability of Standard Askarel-Cooled Transformers.

TRANSFORMER CO. WARREN, OHIO

LIGHTING AND TESTING TRANSFORMERS . . . OIL, ASKAREL OR AIR COOLED



The House of Many Doors

RAYTHEON is truly a house of many doors . . . doors that lead to many research, engineering, and production groups which have made great contributions to the quality and quantity of electronic equipment and receiving and transmitting tubes now helping the armed forces.

Today, behind these closed doors over 16,000 men and women are devoted to war work. Tomorrow, these doors will be wide open and through them will come new developments in all phases of electronics.

Tune in the Raytheon radio program: "MEET YOUR NAVY," every Saturday night on the Blue Network. Consult your local newspaper for time and station.

RAYTHEON
MANUFACTURING COMPANY
Newton and Waltham, Massachusetts

Devoted to research and manufacture of complete electronic equipment; receiving, transmitting and hearing aid tubes; transformers; and voltage stabilizers.

Where it's HOT—or where corrosive vapors cut down the life span of ordinary insulation, Collyer Asbestos Wire eliminates annoying failures of electrical circuits. This wire, covered by a seamless coat of asbestos felt, impregnated with a special insulating and moisture-resisting compound, withstands conditions too severe for other types of insulation. Collyer Asbestos Wire is available . . NOW . . in many constructions for countless uses.

America's war needs still demand most of our production of other Collyer Wire but the day draws nearer when Collyer's complete line of high quality wiring will again be available.

For further information about Asbestos or other types of Collyer Wire, contact your local Collyer representative or write us direct.

COLLYER INSULATED WIRE CO., 257 ROOSEVELT AVE., PAWTUCKET, R. I.

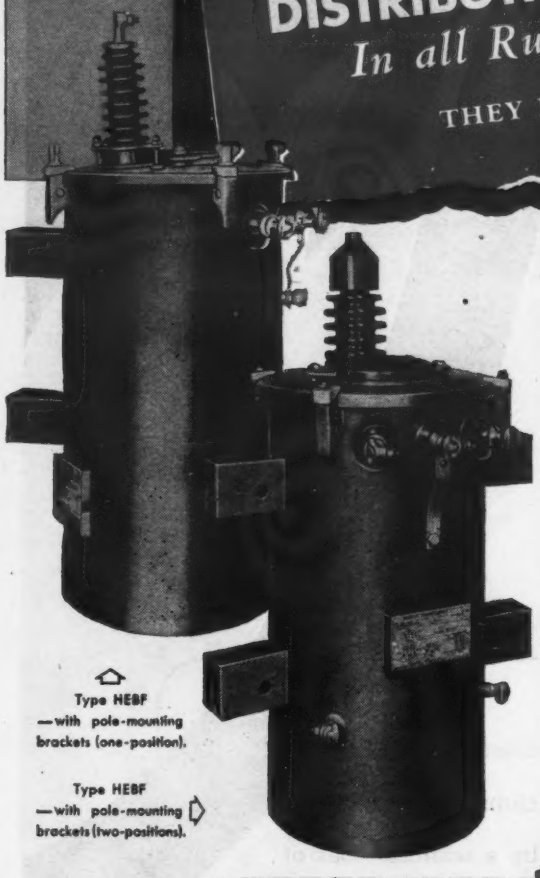
Include

Wagner

DISTRIBUTION TRANSFORMERS

In all Rural-Line Installations

THEY MEET ALL STANDARDS



Type HEBF —with pole-mounting brackets (one-position).

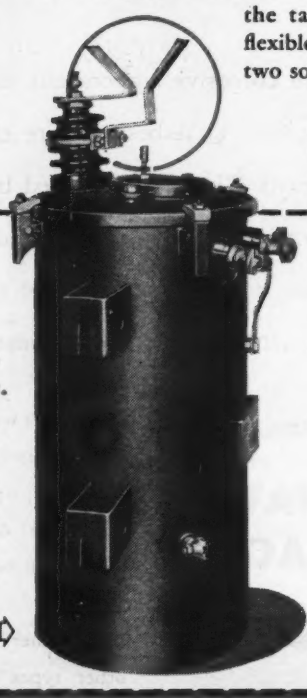
Type HEBF —with pole-mounting brackets (two-positions).

Wagner rural-line distribution transformers, designed to meet all accepted standards, are available in sizes 1-½ to 25-kva for use on 12,470 Grd. Y/7200 and 13,200 Grd. Y/7620 volts, 60-cycle lines with low-voltage ratings of 120/240 volts.

The high standard of quality and performance of all Wagner rural-line transformers is basically the result of improved design and construction of the core and coils which are really the heart of any transformer. Wagner core and coils are fabricated from carefully selected and pre-tested materials and are thoroughly tested for the exacting performance required on rural-line operation.

The high-voltage windings are provided with one high-voltage, wet-process porcelain bushing in the cover. The other end is permanently connected internally to the tank. Three low-voltage bushings are brought out through the tank wall. The low-voltage windings are suitable for two- or three-wire service. The low-voltage neutral may be grounded to the tank through an external ground-strap of flexible braided copper. The tank is provided with two solderless ground connectors.

Write for Complete Information

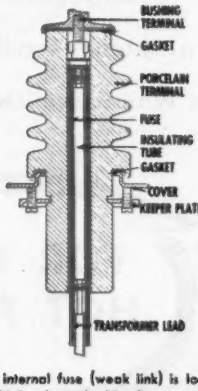


PROTECTIVE ACCESSORIES

available for conventional type Rural-Line Transformers.

No other surge protection or transformer fuses are required when a double "bird-proof" gap and internal fuse (weak link) are combined. The internal fuse provides a protective link between the transformer and the high-voltage line, and the double gap provides surge protection. The conventional type transformers are available with these accessories.

The double "bird-proof" gap is located on the high-voltage bushing.



T44-10

The internal fuse (weak link) is located in the high-voltage bushing between the high-voltage terminal and the primary-coil lead.

ARMY E NAVY

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

Wagner Electric Corporation

ESTABLISHED 1891

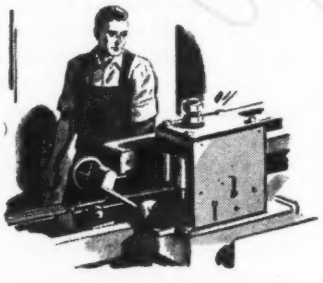
6456 Plymouth Avenue, St. Louis 14, Mo., U. S. A.

ELECTRICAL AND AUTOMOTIVE PRODUCTS

Thinking about reconversion?...

Reconversion may mean headaches to many engineers and production men. To you who are thinking about these problems now, consider industry's new production tools—the applications of electronic tubes and what they are doing today.

FOR EXAMPLE...

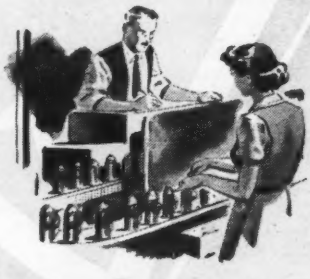


a midwestern manufacturer of heavy equipment saves $15. a ton in hardening steel bars by electronic control . . . a saving of 50% over conventional methods.

FOR EXAMPLE...

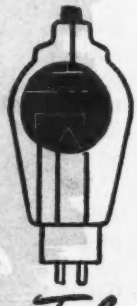
in another plant, shells are accepted or rejected electronically, eight different tests for accuracy completed in split seconds, at a rate of one shell a second.

FOR EXAMPLE...



a maker of hand grenade fuses prevents disastrous and costly explosions by checking the exactness of the powder charge with electronic tubes.

The profitable application of electronic tubes is legion. A look around your plant may disclose ways to save you worry, get increased production and create more profits. It may be in electronic induction or dielectric heating, in welding control, in motor speed control, in inspection, in counting, sorting, weighing. Can you save money or not by putting electronics to work? If you have a hunch about an operation of this kind and need help, let us know. Write Westinghouse Electric & Manufacturing Co., Lamp Division, Bloomfield, New Jersey.



Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

Quality Controlled Electronic Tubes

For industrial tube replacements, remember you can get quick local service from your nearest Westinghouse distributor.

WESTINGHOUSE PRESENTS John Charles Thomas • Sunday 2:30 EWT., N.B.C. ★ Ted Malone • Monday, Wednesday, Friday—10:15 EWT—Blue Network.

AGAIN!

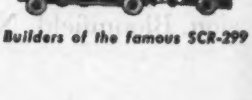
ARMY E NAVY

For the 5th time Hallicrafters employees win Army-Navy "E" Award!

First exclusive manufacturer of short wave radio equipment to receive the coveted Army-Navy "E" Award for the fifth time... the result of the continued and untiring devotion to duty of the company's 1,500 employees.

hallicrafters

THE HALLICRAFTERS COMPANY · MANUFACTURERS OF RADIO AND ELECTRONIC EQUIPMENT · CHICAGO 16, U. S. A.



Builders of the famous SCR-299

Advertisement

SYLVANIA NEWS
CENTRAL STATION EDITION

NOVEMBER *Published in the Interests of Better Sight and Sound* -- 1944

K. C. Employs Boosters to Lick Low-Voltage vs. Fluorescent Problem

In certain buildings in Kansas City, poorly designed wiring systems presented an annoying problem whenever a fluorescent installation was made. The operating voltage was often so low that flickering lamps and slow starting resulted.

The problem was investigated by Arthur E. Smiley, of the electrical contracting firm bearing his name, and Marshall A. Havenhill, illuminating engineer of the Kansas City Power & Light Company; and they recommended booster transformers to raise the voltage to the ideal 118 volts whenever a fluorescent lighting system was proposed.

In small stores and offices where the load is not great, boosters are installed directly ahead of the lighting distribution panels.

And in larger installations, where there are many sub-feeders and lighting distribution panels, the boosters are best installed ahead of the panels containing the branch circuits for the fluorescent lighting systems.

DID YOU KNOW...

Motors operating at full speed are made to appear motionless under the stroboscopic light produced by Sylvania's electronic Strobotron tube? Thus "trial-and-error" trouble shooting is fast being eliminated in many industrial applications.

★ ★ ★

That the Sylvania Blacklight Lamp, when used in a child's nursery, will illuminate wall decorations in a night-darkened room? Bad news for the bogey-man.

★ ★ ★

That a tiny device called the Recorder Lamp —made by Sylvania—makes possible the accurate transmission of photos by radio? This lamp faithfully records the photo, as it is being broadcast on sensitized paper.

Fixture Competition Spurs Interest Among Utility Lighting Groups

Designers Competing for Total of $1600 in Prizes to be Awarded by Sylvania

Hundreds of entries—representing every state in the Union—have been received in the Sylvania Fluorescent Fixture Design Competition. This enthusiastic response is gratifying, for it re-emphasizes the keen and constant interest of utility lighting men in better fixture design.

DEAD LAMPS CUT OFF BY STARTER

A newly designed fluorescent lamp starter —recently placed on the market by Sylvania—takes over the job of cutting dead lamps out of the circuit.

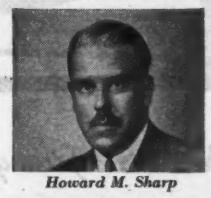
Lamps that have failed in service, if allowed to remain in the circuit, cause undue power losses, and may result in overheating ballast and damaging starter.

The new Sylvania device, known as the COP (Cut-Out Premium) Starter, will handle the cutting out automatically. Under failed lamp conditions—with starting current repeatedly flowing—sufficient heat is generated in a resistor to operate a bimetal latch which breaks the circuit to the failed lamp. A push button resets the starter for normal operation.

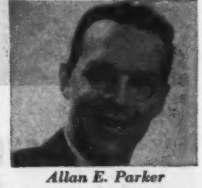
"But the night shift never knows when it's daylight since we put in Sylvania Fluorescents. Gentlemen, we need a rooster."

JUDGES READY AND WAITING

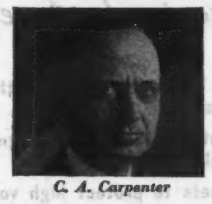
On December 1, the judges will begin their task of deciding which fourteen designs for a post-war commercial four-lamp fluorescent fixture are best. In view of the large number of entries, theirs will be a big job. January 1 is the date set for the announcement of winners' names.



Howard M. Sharp



Allan E. Parker



C. A. Carpenter

Lurelle Guild

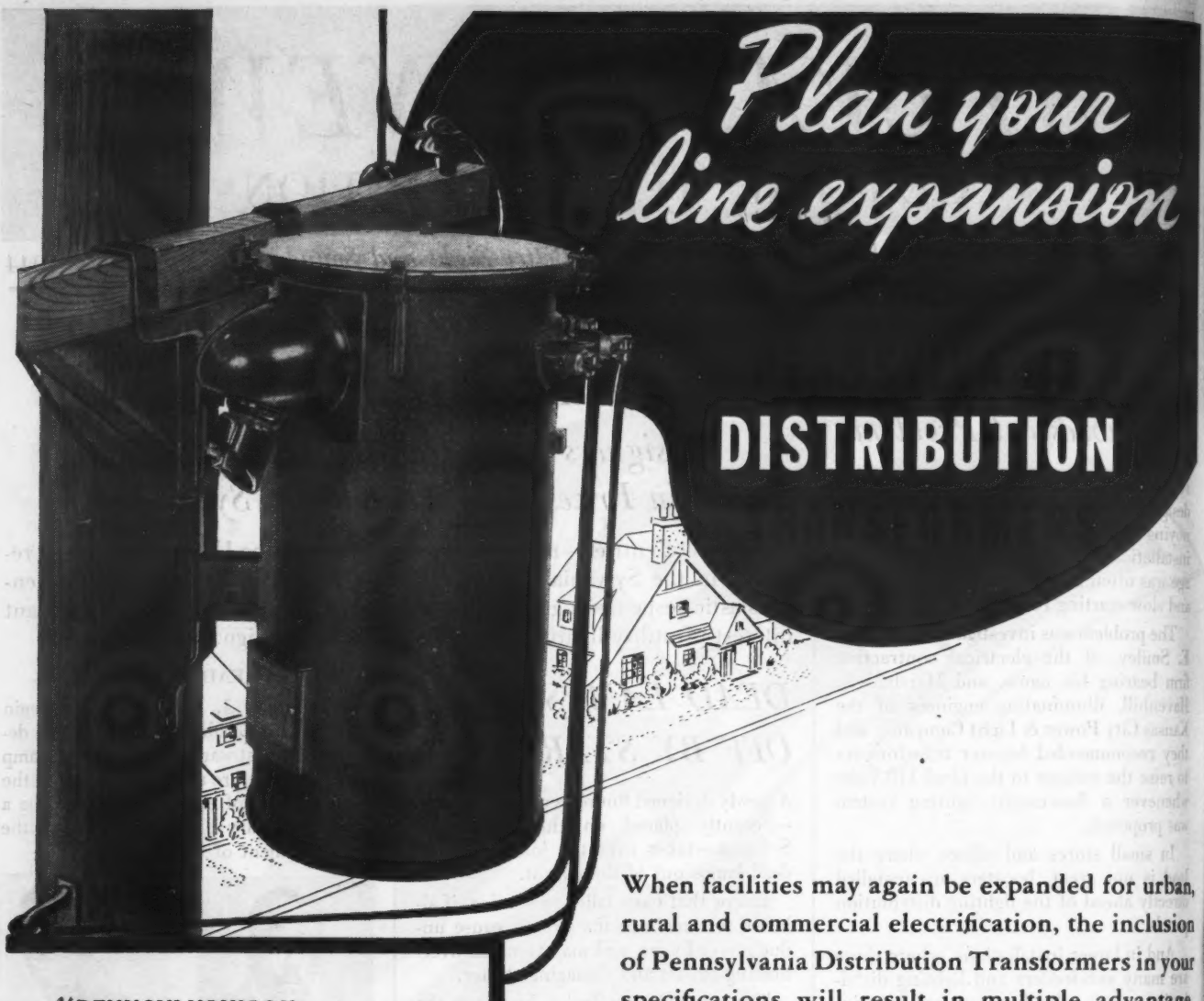
DELIVERY DATE IMPORTANT

We would like to urge all entrants to schedule their work so as to insure mailing of their designs to Sylvania, Salem, Mass., *before December 1.* This is a rigid requirement. Each design will—and must —receive the careful consideration of all judges; hence, the deadline cannot be extended beyond November 30, 1944.

Don't forget the prizes!—$500, $300, $200, $100—plus an expense-free trip to New York where the major prizes will be awarded. And ten additional prizes of $50 each will be mailed to those who enter the ten next best designs.

SYLVANIA ELECTRIC PRODUCTS INC.
Salem, Massachusetts

MAKERS OF FLUORESCENT LAMPS, FIXTURES, ACCESSORIES, INCANDESCENT LAMPS, RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES



Plan your line expansion

DISTRIBUTION

"PENNSYLVANIAS" ***give you these superior features..***

- **Circular Coils for maximum strength and balanced stresses.**
- **Low temperature varnish impregnation maintains pliable insulation.**
- **Oversize pockets to protect high voltage bushings.**
- **Round tanks with permanently tight lock-seam Welded bottoms.**
- **Easily detachable, wet-process porcelain bushings.**
- **Built up core laminations of high grade silicon steel.**
- **Coil easily and quickly removable from core if necessary.**
- **Extra-sturdy lift lugs and support lugs.**
- **Shot blasting prepares surface for one coat of red primer and two finish paint coats.**

When facilities may again be expanded for urban, rural and commercial electrification, the inclusion of Pennsylvania Distribution Transformers in your specifications will result in multiple advantage. *Pennsylvanias* have won an enviable reputation for reliable performance, exceptionally low operating cost, reduced upkeep and long life.

These qualities have been clearly demonstrated in a period when maximum loads with minimum maintenance have been the rule rather than the exception. The outstandingly successful performance record of Pennsylvania Distribution Transformers results from a combination of advanced design features, coupled with quality materials, workmanship and specialization.

Plan with Pennsylvanias. *Pick Pennsylvanias for Performance.*

Pennsylvania Transformer Company

808 RIDGE AVENUE N. S. PITTSBURGH 12, PA.

Pennsylvania TRANSFORMERS

In the Field of

RADIO NOISE ELIMINATION,

Tobe is the Acknowledged Leader!

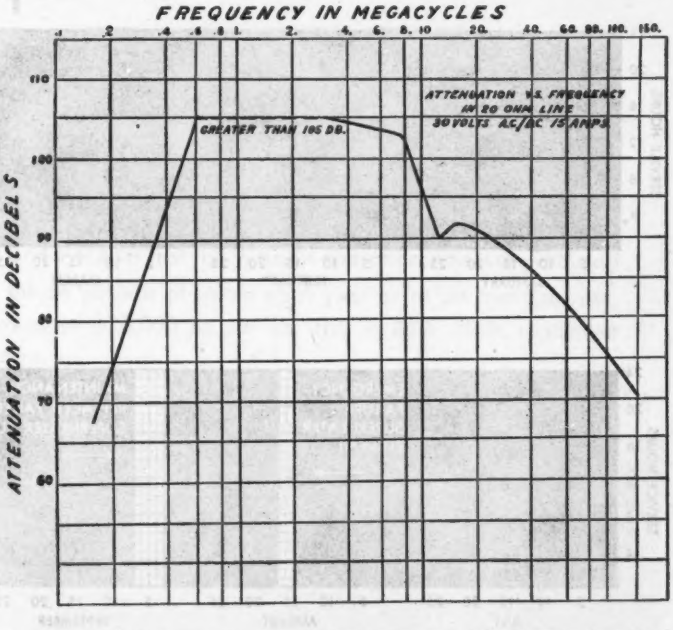
ONE engineering result of the war is increased knowledge of radio interference problems. It will never be lightly treated again. No engineer can tackle the development of an electrical design without giving due consideration to minimizing the radio interference it creates in operation. Specially designed filters, to be built into electrical circuits, can usually solve the problem of radio interference.

Here at Tobe is a great storehouse of knowledge in this subject. It is *sound* knowledge, gained by the most intense interest and experience of any company in the field.

Tobe Filterizing is a copyrighted term. It means that Tobe knows how to "filterize" man-made radio noise. Why not make use of this valuable 16 years' of experience in your own engineering? Place your reliance on Tobe and the famous Tobe Filterettes. Send us your problems now.

CONTAINER DIMENSIONS

Length	3 1/16"
Width	2 1/8"
Height	2 7/8"
Overall length	5 7/32"


FREQUENCY IN MEGACYCLES
.1 .2 .4 .6 .8 1. 2. 4. 6. 8. 10 20. 40. 60. 80. 100. 150.
ATTENUATION IN DECIBELS
110
100
90
80
70
60
ATTENUATION VS. FREQUENCY IN 20 OHM LINE 50 VOLTS AC/DC 15 AMPS.
GREATER THAN 105 DB.

LONG LIFE ASSURED!

TOBE DEUTSCHMANN CORP.
CANTON, MASS.

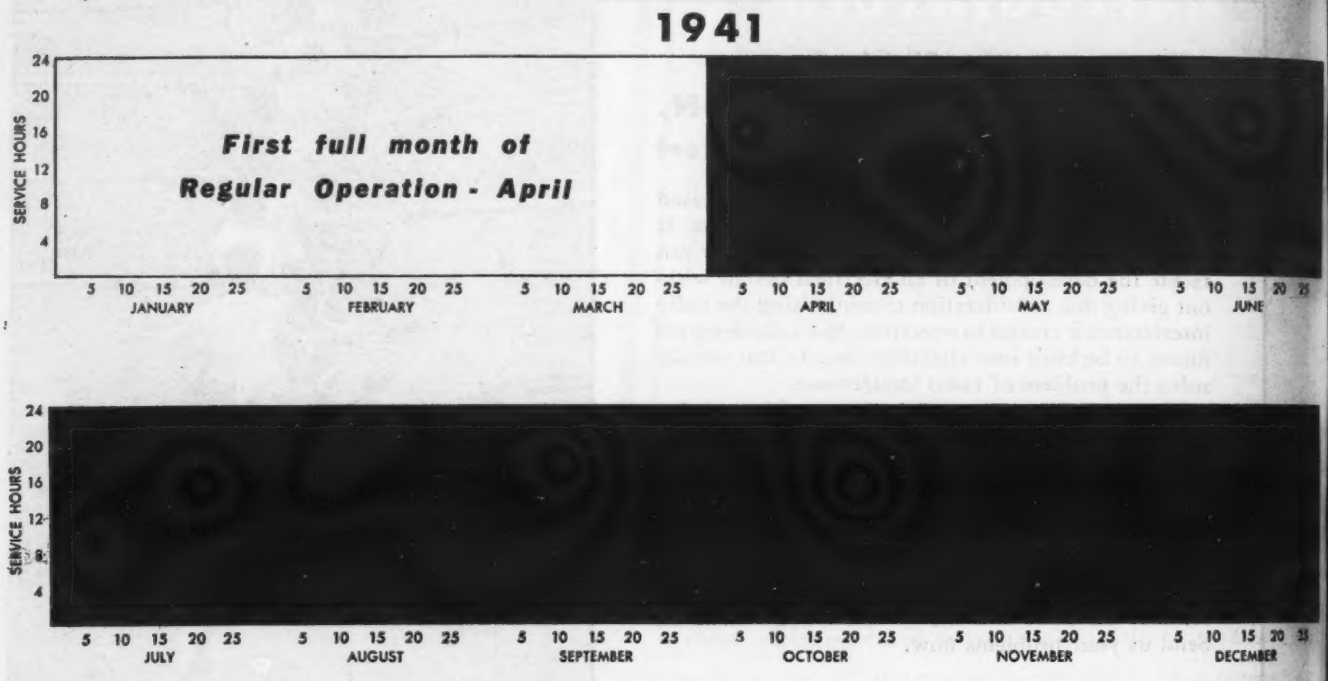
SUPPRESS MAN-MADE RADIO STATIC
TOBE
FILTERIZED

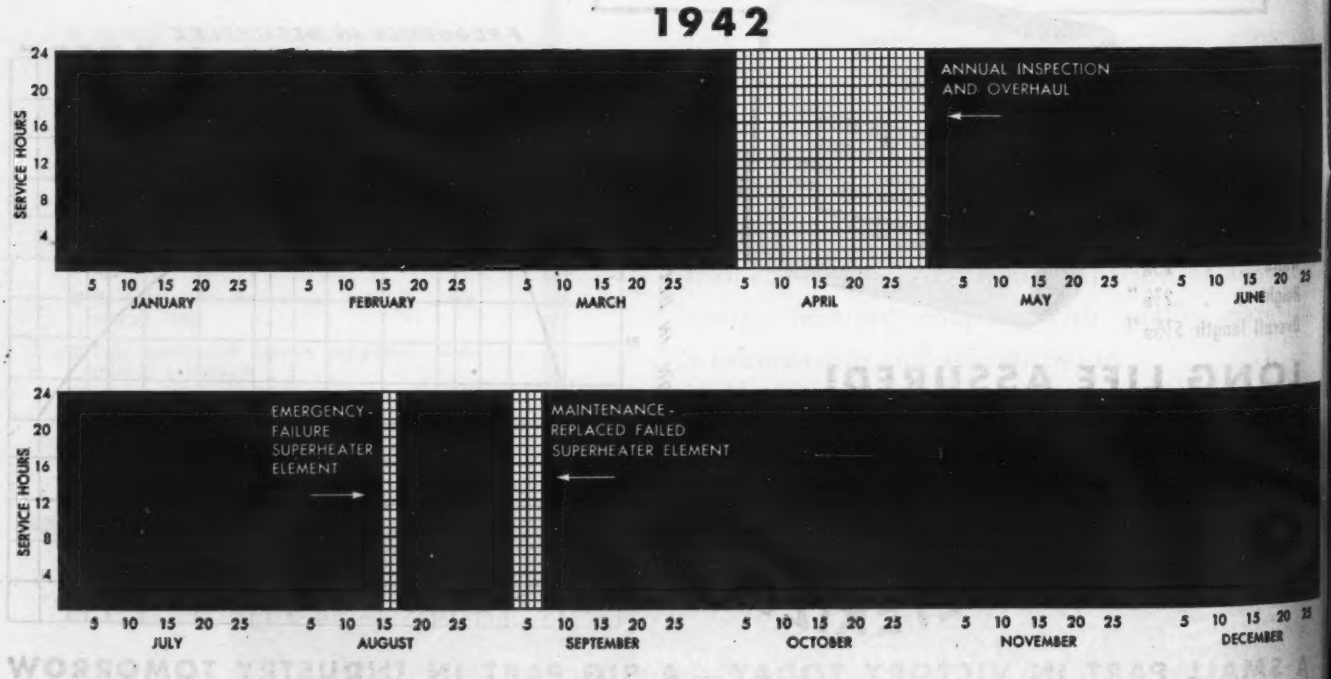
A SMALL PART IN VICTORY TODAY — A BIG PART IN INDUSTRY TOMORROW

LESS THAN 1% FORCED OUTAGE . . .

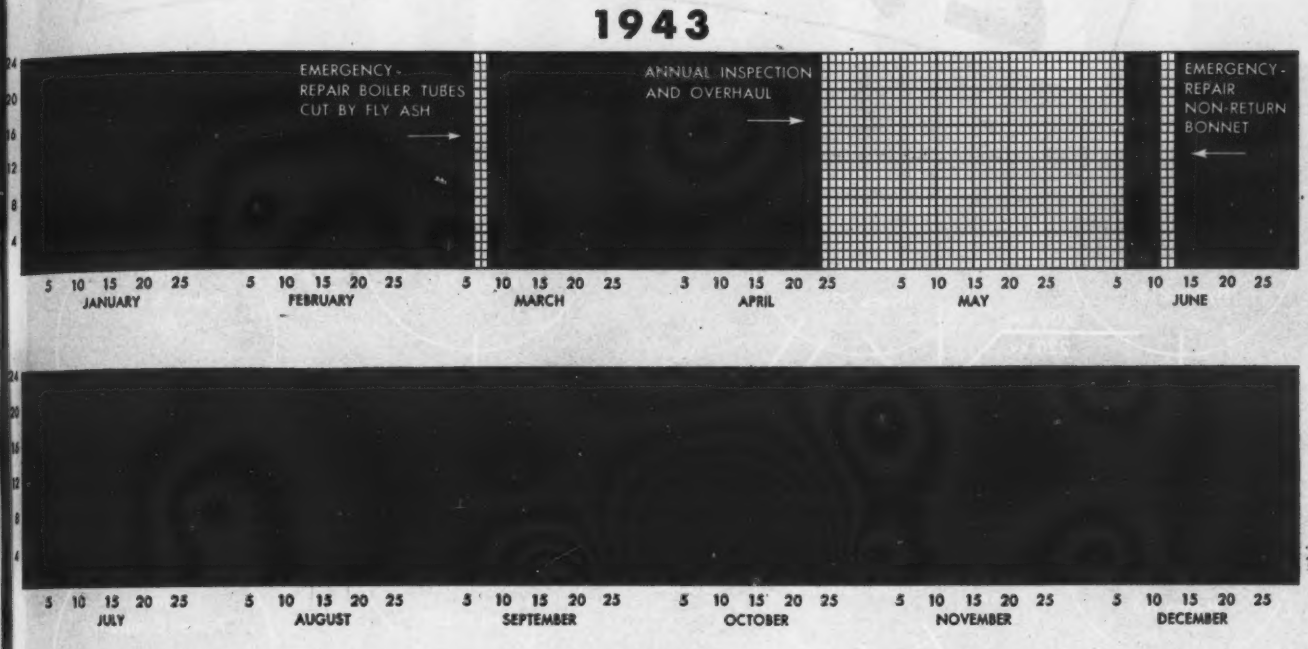
OPERATING RECORD

The outage charts reproduced here provide graphic evidence of another excellent operating record achieved by a C-E Unit — this time in the Manchester St. Station of Narragansett Electric Company at Providence, R. I. This unit is designed to produce, at maximum continuous capacity, 430,000 lb of steam per hr at 1225 psi and 915 F. It uses either pulverized coal or oil and this performance record includes operation with both fuels.





OVER A 3-YEAR PERIOD



3 YEAR USE FACTOR 95.6%

During the period from April 1, 1941 to April 1, 1944, a total of 26,280 hours, this unit was in service 25,128 hours, or 95.6% of all the time for three years under war-time conditions. Of the 4.4% outage time 3.5% was devoted to annual scheduled inspection and overhaul. Less than 1% was lost due to forced outage.

USE-CAPACITY FACTOR 86%

During 1942 and 1943, its first full years in operation, this unit produced just under 3 billion pounds of steam each year or at an average rate, while in service, of 370,000 lb per hr. This is 86% of its *maximum continuous capacity*.

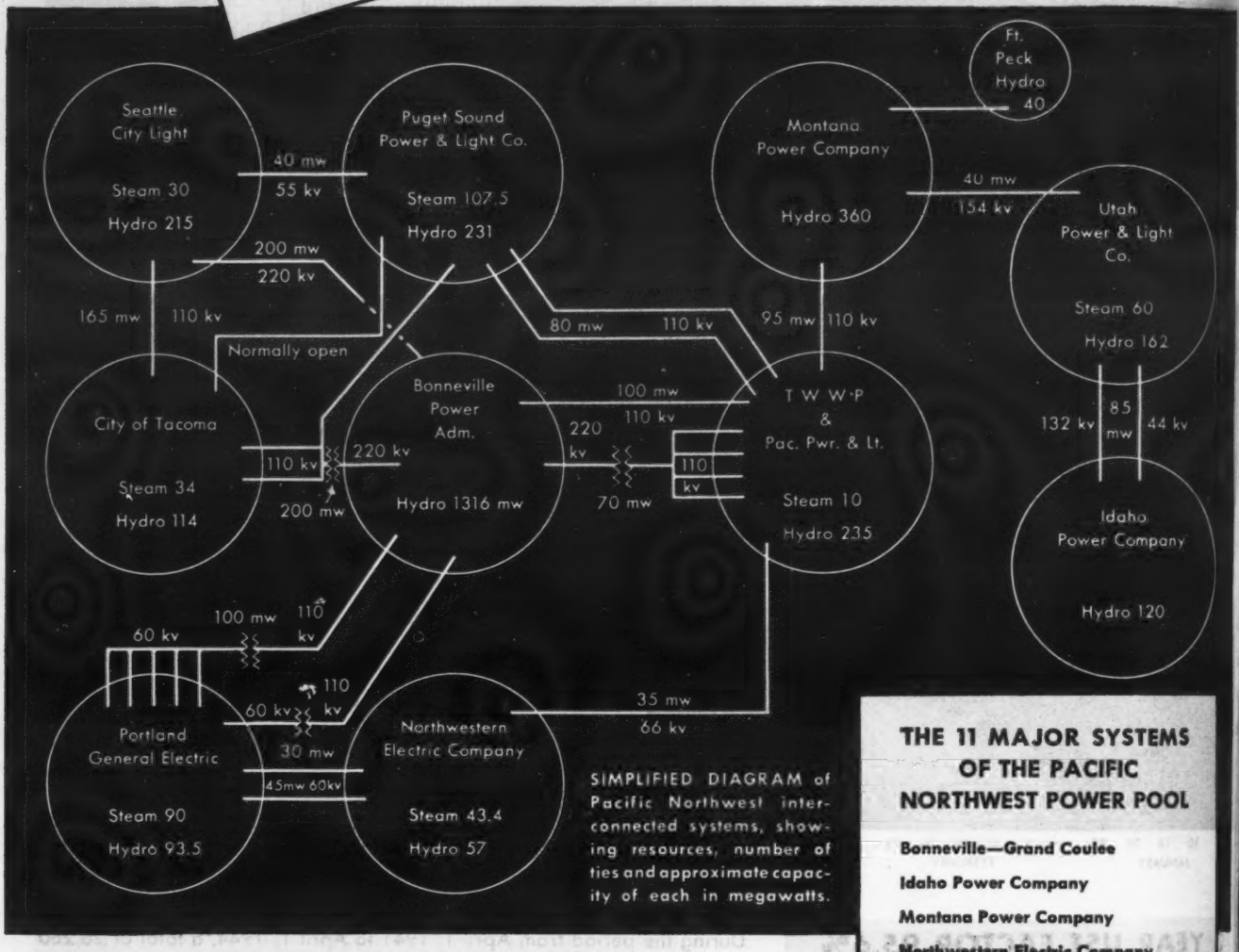
A 841

COMBUSTION ENGINEERING C-E

200 MADISON AVENUE NEW YORK 16, N. Y.

E PRODUCTS INCLUDE ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

29 out of 30



SIMPLIFIED DIAGRAM of Pacific Northwest interconnected systems, showing resources, number of ties and approximate capacity of each in megawatts.

THE 11 MAJOR SYSTEMS OF THE PACIFIC NORTHWEST POWER POOL

- Bonneville—Grand Coulee
- Idaho Power Company
- Montana Power Company
- Northwestern Electric Company
- Portland General Electric Company
- Puget Sound Power & Light Company
- Seattle City Light
- Tacoma City Light
- Utah Power and Light Company
- Washington Water Power Company and Pacific Power and Light Company

29 out of 30 Batteries at connecting points in the Pacific Northwest Power Pool are EXIDES

THE Pacific Northwest Power Pool is a milestone in the progress of the electric power business. Through a network of 13,000 miles of transmission lines this interconnection pools the resources of eleven major private, municipal and federal systems in a five state area with generator rating of 3,353,500 kw.

In this complex system, there are 30 connecting substations, all but one of which is equipped with an Exide Battery. 29 out of a possible 30! A fitting tribute to a really fine battery.

Exide Batteries have proven their dependability, long-life, and ease of maintenance for control bus operation. They have earned the confidence of engineers everywhere, and their widespread use in public utilities and private industrial plants is proof of that faith.

ARMY E NAVY

Exide BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

Vinylite

TRADE-MARK

Outspinning the spider

The spider is an engineer—a master of construction and design. While man piled massive stone on stone for the pyramids, the spider built with an extruded material of airy lightness and amazing strength—presaged the whole trend of modern practice.

Today, VINYLITE extruded elastic plastics bring this same invaluable combination to wire and cable insulation. With excellent dielectric properties, they permit new thin-wall construction, with notable reductions in the weight and thickness of insulation on electrical conductors. More circuits can be inserted in existing conduits. And to insulation properties unsurpassed by older types, thin-wall insulation of VINYLITE elastic plastics adds unusual resistance to chemicals, oils, grease, and abrasion. It stays flexible at low temperatures — has a very low rate of moisture absorption. Certain types are non-flammable or slow-burning. It can be made transparent or opaque, in an infinite variety of colors.

Insulation made from VINYLITE elastic plastics sets up new standards of life and service for the full range of conductors, from portable cords to power cables. Write Department 28 for booklet VR. It describes all the VINYLITE plastics for wire and cable insulation, and explains the specific advantages of each for different types of application.

BAKELITE CORPORATION
Unit of Union Carbide and Carbon Corporation
UCC
30 EAST 42ND STREET, NEW YORK 17, N. Y.

Plastics

Flown 1,000 miles to perform the greatest fire-fighting achievement in the history of the sea . . . 150 miles off the Canadian Coast . . . Rockwood WaterFOG equipment helped eight Navy firemen subdue a fire that had been raging for 30 hours on the transport U. S. S. Wakefield (former "Manhattan"). Thus our second largest transport, seemingly doomed to certain destruction, was saved for further service.

Navy, Coast Guard, Maritime Commission and Army and hundreds of industrial plants rely on WaterFOG equipment—fixed piping or hose nozzles—to put out oil fires fast. For WaterFOG is man-made fog . . . water broken up into tiny particles by impinging streams of water from specially-designed Rockwood nozzles.

Its fire-fighting principle is simple . . . speed of heat absorption increases with surface area exposed to heat. Rockwood nozzles multiply many times the total surface area of a given volume of water, giving it capacity to cool fires faster. Furthermore, WaterFOG drifts over the liquid (instead of plunging into it), thereby retarding vaporization. Finally, it becomes steam, shutting off air. Thus, it cools, confines, starves the fire.

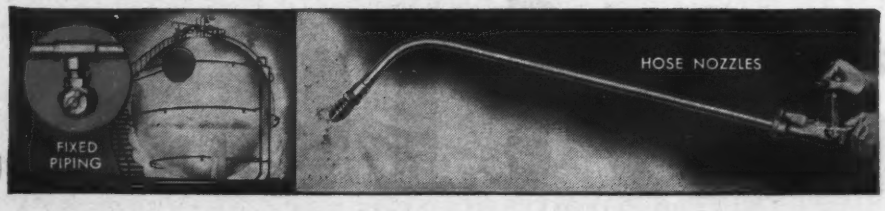
With WaterFOG, less water is needed, saving water and water damage. "Flash-back" is prevented. Electrical fires are controlled with minimum of damage. Rockwood-engineered installations are approved by Underwriters' Laboratories and Associated Factory Mutuals.

Write today for Bulletin 123.

ROCKWOOD SPRINKLER COMPANY
62 Harlow Street, Worcester 5, Mass.
Specialists in Fire Protection Engineering, Equipment and Installation since 1907

ROCKWOOD WaterFOG

Water Engineered by Rockwood Cools, Confines, Smothers Oil Fires



Oil Fire in Shell Plant Nipped by WaterFOG

Under the grating is a 4000-gallon quench tank. Shell casings leaving the hardening furnace are immersed in the oil before reaching the conveyor at the right.

When the oil in that tank caught fire, it took only 9 seconds for WaterFOG to put it out!

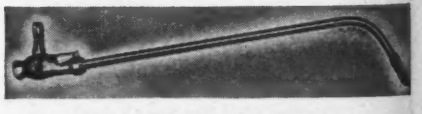
The only damage was blistered paint on wood post near the discharge end of the furnace. The quench tank was back in operation shortly after.

One of the WaterFOG heads is shown circled. It is protected by a blow-off cap. Each of the heads is connected by fixed piping to a Deluge Valve which supplies water upon the automatic detection of fire.

On this and many other oil fire hazards, a WaterFOG system of fixed piping, heads, valves, and automatic controls has proved to be the most efficient form of fire protection. Because the spacing of heads, distance between heads and hazard, and other factors are important in determining correct particle size, fog pattern, and velocity, it is recommended that WaterFOG systems be installed by ROCKWOOD engineers (authorities on hydraulics as applied to fire protection).

Typical WaterFOG Applications
- transformers
- oil switches
- generators
- paint shops
- oil storage
- regulators

etc.



Portable WaterFOG Equipment for Regular Fire Hose Lines

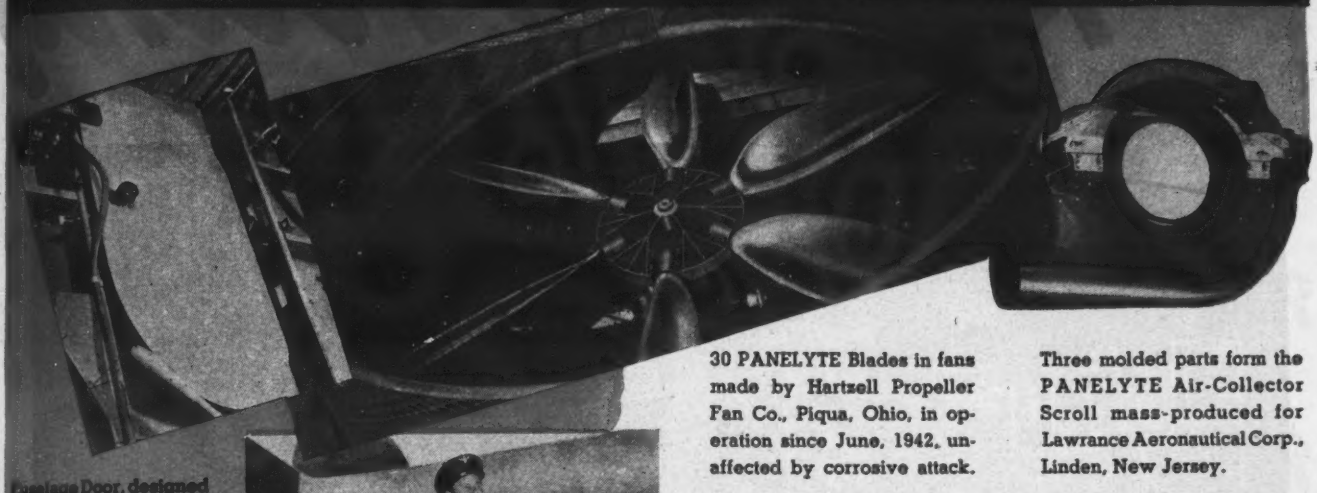
The photograph shows Rockwood's SG-40 Nozzle equipped with extension applicator which discharges low-velocity WaterFOG in ball shape.

With the applicator removed and a FOG Tip inserted, this nozzle will discharge either high-velocity WaterFOG with considerable forward projection, or a straight stream for attacking inaccessible places or rooting out deep-seated fires.

The 1½" SG-40 Nozzle takes 4' or 10' applicator; the 2½" size takes 12' applicator.

EXECUTIVES: A colored movie (16 mm.) showing tests of Rockwood WaterFOG is available.

PANELYTE* Precision Molding



30 PANELYTE Blades in fans made by Hartzell Propeller Fan Co., Piqua, Ohio, in operation since June, 1942, unaffected by corrosive attack.

Three molded parts form the PANELYTE Air-Collector Scroll mass-produced for Lawrance Aeronautical Corp., Linden, New Jersey.

Fuselage Door, designed by PANELYTE engineers in cooperation with Glenn L. Martin Co., saves weight and has superior resistance to vibration. Both sections of complex part molded in one press in a single operation.

Navigator's Table Drawer molded of paper base PANELYTE; pull handle is integral part; unit shipped ready to install.

PANELYTE Aircraft Flooring—laminated top sheet molded onto a corrugated base with aluminum insert integrally molded into lower horizontal surface—surpasses all standard floorings in high strength, lightweight characteristics. Developed by Martin engineers and used in Martin "MARS".

Permits Unusual Sizes and Intricacy of Design

So rapidly have PANELYTE molding techniques advanced that parts molded in straight-line mass production today would have been considered impractical, if not impossible, 2 or 3 years ago. Weight-saving parts illustrated show wide variation and intricacy of design now attained by compression molding in powerful hydraulic presses. Steel or special alloy dies are used for curing and setting PANELYTE parts – including some of the largest yet to be produced in thermo-setting plastic. Sharp compound curvatures and considerable depth of draw also easily handled.

You will find our Engineering Staff of practical assistance in the design and economical production of fabricated as well as molded parts in paper, fabric, fibre glass and asbestos base laminated plastics.

PANELYTE — *the structural plastic*

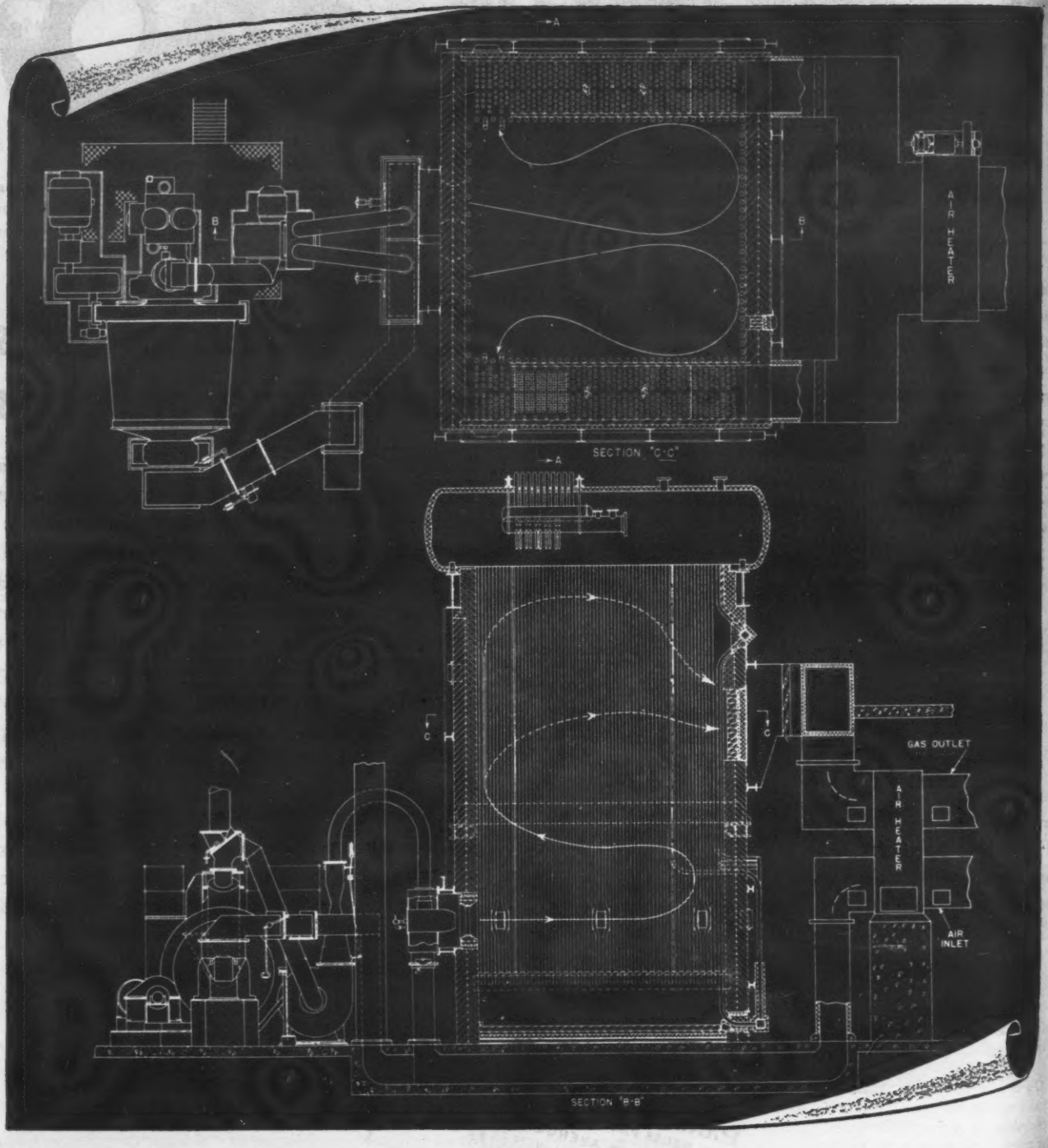
PANELYTE DIVISION
ST. REGIS PAPER COMPANY
230 PARK AVENUE
NEW YORK 17, N. Y.

Sales Offices: Atlanta, Boston, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Kansas City, Los Angeles, Mexico City, Montreal, New Orleans, St. Louis, St. Paul, San Francisco, Seattle, Syracuse, Toronto, Trenton, Vancouver

*

MASS PRODUCTION OF SHEETS, RODS, TUBES, MOLDED FORMS, FABRICATED PARTS

Reverse Firing



FW

FOSTER

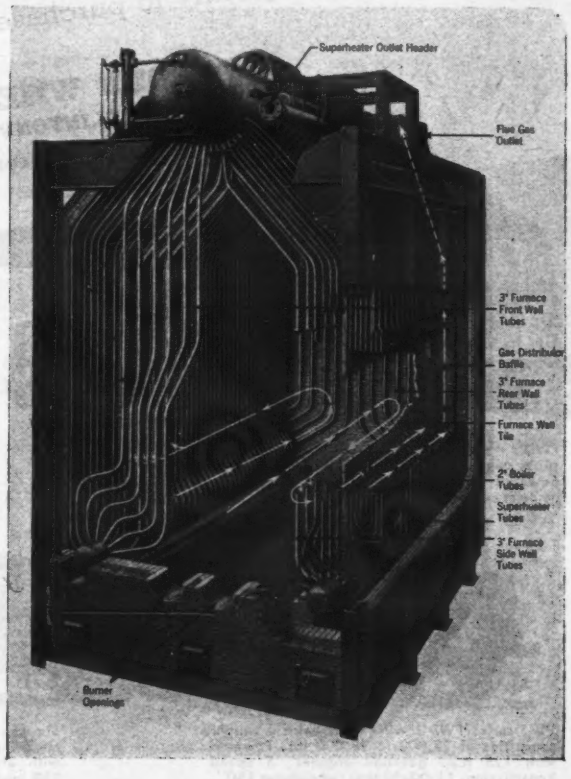
Reduces . . .

- ✓ CARBON LOSS
- ✓ ASH CARRIED *INTO* BOILER
- ✓ SLAGGING *OF* BOILER

AND SUPERHEATER

Reverse Firing

—GASES TWICE TRAVEL THE LENGTH OF THE FURNACE—IS A PATENTED FEATURE USED IN THE "S-A" STEAM GENERATOR



FOSTER WHEELER CORPORATION
165 BROADWAY NEW YORK 6, N. Y.

WHEELER

FWD TRUCKS AVAILABLE FOR CIVILIAN PURCHASE ON AND AFTER JANUARY 1, 1945

MOTOR TRUCK NEWS FLASH!

GOOD NEWS — FWD four-wheel-drive trucks, pre-eminent in war services, with production previously restricted almost exclusively for the military, are soon to be available for motor transport, highway, utility, oil fields, and other essential civilian services.

Recent directive from the WPB provides for production of substantial number of FWD trucks in a wide variety of models and types, 2½ to 15 tons capacity; such trucks to be built only for essential civilian uses. FWD trucks built under this release will be available for purchase on and after January 1, 1945. Deliveries will be made in keeping with priority of orders as received; immediate action and prompt placing of orders is urgent to assure delivery before limit of production is reached.

Write—wire—or phone us directly, or the nearest authorized FWD dealer for full information and your eligibility to purchase under these new rationing regulations.

THE FOUR WHEEL DRIVE AUTO CO.
CLINTONVILLE, WISCONSIN
CANADIAN FACTORY: KITCHENER, ONTARIO

ARMY NAVY

FWD TRUCKS

FWD's "H" series tractor trucks with four-wheel drive and gross vehicle weight ratings from 40,000 lbs. to 60,000 lbs. Powered with gasoline engines ranging from 100 to 120 horsepower on wheelbases from 120" to 144" in conventional or cab-over-engine types.

These and other FWD Trucks, 2½ to 15 tons capacity, available to qualified purchasers.

"U" series FWD's with gross vehicle weight capacities of 22,000 to 28,000 lbs. Powered with 125 h.p. gasoline engines, 5 speed transmission, 11:00x20 tires, wheelbase 130". Four wheel drive.

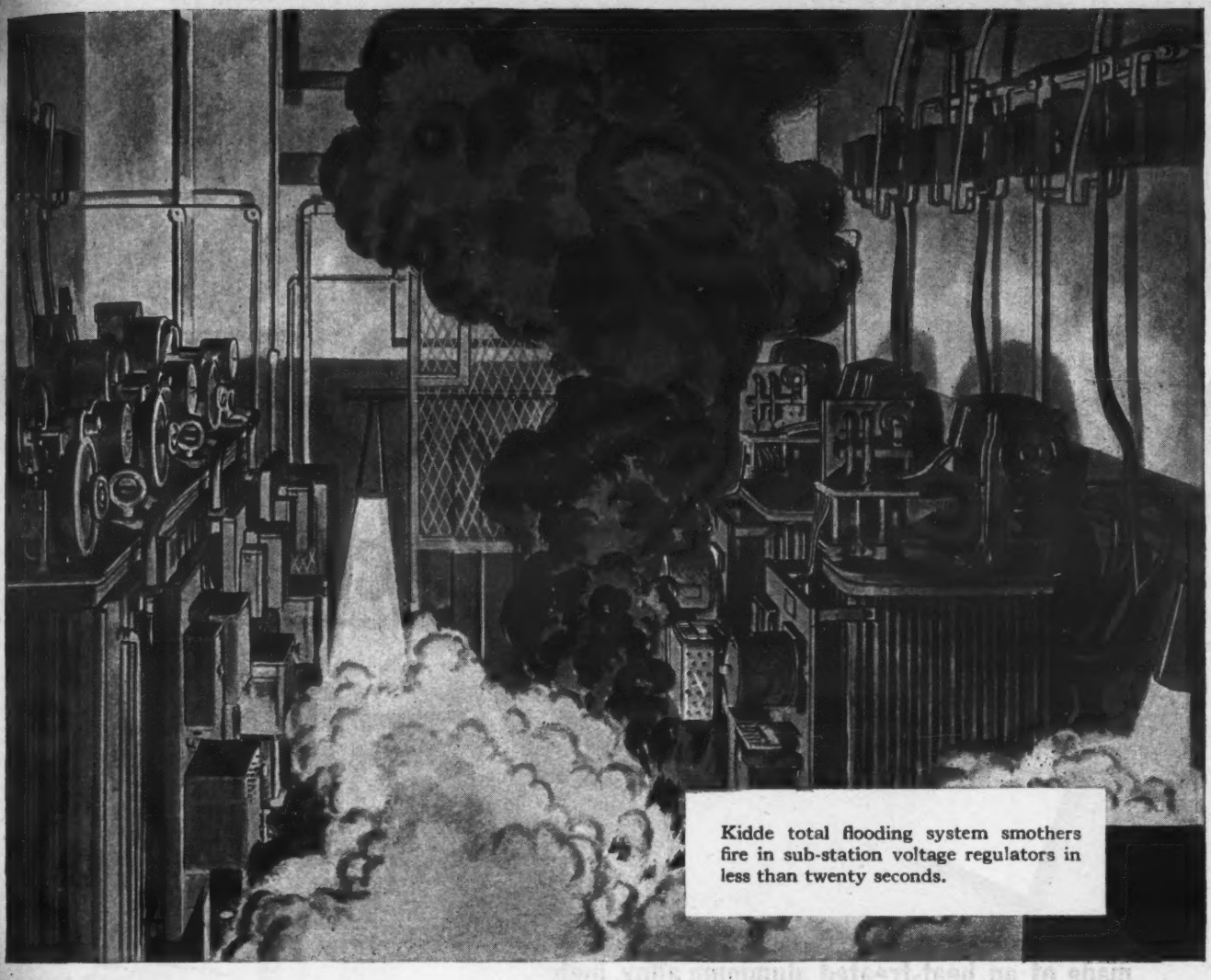
Six-wheel drive FWD trucks with gross vehicle weight capacities of 55,000 lbs. Powered with either gasoline or diesel engines of 150 and 200 horsepower. Wheelbase from 214½" to 276".

Straight trucks in FWD's "H" series range 17,000 to 20,000 lbs. gross vehicle weight capacity with wheelbases from 144" to 156" gasoline engine powered with power plants from 100 to 120 horsepower and with four-wheel drive.

Utility Line Construction and Maintenance trucks by FWD with 5 and 7 man cabs, special power-take-offs and line bodies. Powered with 115 h.p. engine on 144" wheelbase with four-wheel drive, 5 speed transmission, 144" wheelbase and 9:00x20 tires.

FWD's four-wheel drive Road Maintainer — built for underbody scraper use with extra heavy frame and other features that make it the ideal unit for street and road maintenance. Engine 115 h.p. — 5 speed transmission — 8:25x20 dual tires.

"M" series FWD's powered with either gasoline or diesel engines ranging from 150 to 200 h.p. and with capacities ranging from 30,000 to 42,000 lbs. gross vehicle weight. Four wheel drive.



Kidde total flooding system smothers fire in sub-station voltage regulators in less than twenty seconds.

BEFORE TOUGH FIRES GET TOO TOUGH

...blast them out with Kidde!

The fires that break out in sub-stations are really tough to fight—but Kidde built-in systems bring them quickly under control by smothering them under a blanket of dry, inert, non-conducting carbon dioxide.

There's no damage to insulation or water-soaking of apparatus when you use Kidde equipment—it limits the loss to the point of rupture. Equipment is back in service with the minimum of interruption.

Generators and other rotating machinery, switchgear, condensers, regulators and other electrical apparatus are all protected with equal efficiency by Kidde equipment. Remember, too, that all laboratories approve Kidde equipment for fighting class B fires in flammable liquids as well as for class C electrical fires. Install Kidde equipment for the protection of such hazards as flammable liquid storage and oil reclamation rooms — to give *complete* protection throughout your plant. Call in a Kidde representative for advice on the selection of equipment for each tough-fire area in the accompanying list. Write today.

KIDDE KILLS TOUGH FIRES

- Generators
- Motors
- Condensers
- Converters
- Transformers
- Switchgear
- Lightning Arresters
- Rectifiers
- Regulators
- Flammable Liquid Storage
- Filter Recirculation

Walter Kidde & Company, Inc. • 140 Cedar Street, New York 6, N. Y.

NEW - a complete line of ALUMINUM POWER CONNECTORS

made of an heat-treated aluminum alloy, high in tensile-strength, elongation, conductivity!

Keeping constantly abreast of utility connecting requirements, Burndy now supplies aluminum connectors for connecting aluminum conductors, or aluminum to copper .. *in sizes and types for all power needs.*

This new Burndy line is made of a specially selected heat-treated aluminum alloy which combines *high tensile strength, high conductivity,* and *high elongation.* This latter property overcomes embrittlement; permitting the connector to conform tightly to the conductor without danger of cracking.

The design of each connector, too, has been determined through long, rigorous testing in the thorough Burndy way ... to assure the proportioning essential for *enduring high joint pressure* in service.

If aluminum has a place in your future sub-station plans, let us consult with you regarding these new aluminum connectors. Communicate with the Burndy representative near you, or write to connector headquarters. Burndy Engineering Co., Inc., 107J Bruckner Blvd., New York 54, N. Y.

Headquarters for CONNECTORS

Burndy

MORE POWER TO YOU

Through Anaconda Copper Bus Conductors

COPPER HAS ALWAYS been the most widely used material for bus conductors. In addition to the basic requirement of high conductivity and consequent low current losses, copper provides high thermal conductivity, high strength and high resistance to corrosion. Accessory equipment is readily available.

And Anaconda Copper Bus Conductors are available in shapes to meet every power transmission requirement:

Flat Bars, requiring minimum space, may be bent or twisted, connected to apparatus without special joint preparation, and in laminated construction have unlimited d.c. capacity.

Tubes provide the highest bus conductor efficiency at a.c. frequencies, have greater rigidity, less surface area for dissipation of heat and may be oil or water cooled.

Channels, with large surface area and ventilation feature reduce temperature rise, have greater rigidity for long runs than tubes, flat surfaces for tap-off.

Angle Squares, ventilated hollow busses with highest rate of heat dissipation handle greater current density but require more space for installation.

Cables solve many problems in conducting extremely heavy currents in confined space or in connecting moving apparatus such as arc or resistance furnaces.

Information, including our Bus Conductor Booklet C-25, and the advice of our Technical Department on various bus conductors and assemblies, is available on request.

44119

ANACONDA
from mine to consumer

Anaconda Copper

THE AMERICAN BRASS COMPANY—General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company—In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

PERMANENT

PROTECTION TO CABLE ENDS IS THE PRIMARY PURPOSE OF G&W POTHEADS

GENERAL CABLE CORP. STANDARD DESIGNS OF POTHEADS ALSO WILL BE MANUFACTURED BY G & W AND WILL BE AVAILABLE AGAIN SOON

Also OZITE compounds

G&W RESISTOYL GASKETS

AND PROPERLY DESIGNED JOINTS HAVE SOLVED THE PROBLEM OF MAINTAINING TIGHT POTHEADS

G&W ELECTRIC CABLE DEVICES

G & W ELECTRIC SPECIALTY CO.

7780 DANTE AVENUE • • CHICAGO, ILLINOIS

In Canada—Powerlite Devices, Ltd., Toronto, Ont.

POTHEADS . . . BOXES . . . OIL FUSE CUTOUTS . . . OIL SWITCHES AND MULTIPLE CIRCUIT OIL DISCONNECTS

Let us help you *Deliver the Goods!*

UNITED STATES STEEL SUPPLY COMPANY

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TWIN CITY, 2545 University Ave., St. Paul (4), Minn.
Teletype STP. 154 NEstor 2821

OUR definite progress towards victory has been made possible by all hands working together and delivering materials to our fighting men. For the bravest men in the world can't fight without weapons and supplies.

Perhaps you need help in turning out war goods—steel, steel products, tools and machinery; if so, get in touch with our nearest warehouse. We have nine of them, located in the big production centers and our men will break their backs to get goods to you in a hurry.

We have large stocks, even today, including the National Emergency Alloy Steels which have proved so successful. Try us—we have helped speed many a war order. Your call will receive quick action. Write, wire or phone our nearest warehouse.

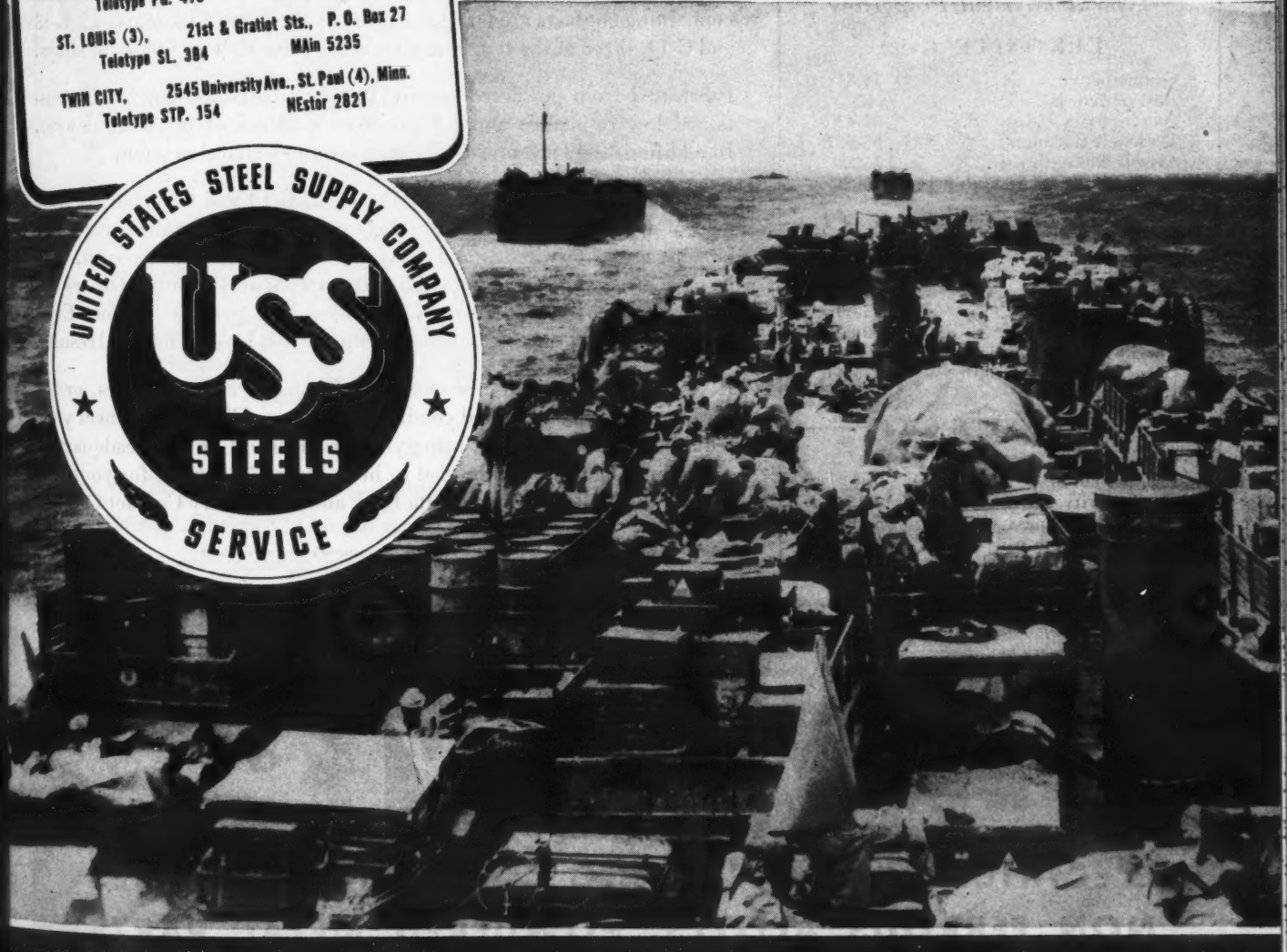
NEED WELDING MATERIALS?

We can supply Welding Wire, for electric arc welding, such as:

STAINLESS STEEL ELECTRODES
HARD-SURFACING ELECTRODES
MILD CARBON ELECTRODES

We also offer Welding Machines, Protect-O-Metal for elimination of weld spatter and Havens "C" Protected Clamps. Write, phone or wire our nearest warehouse.

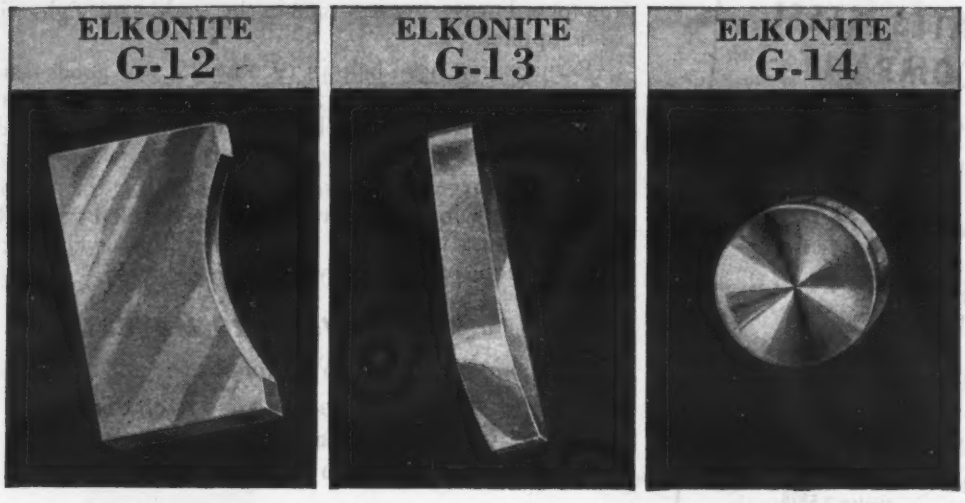
UNITED STATES STEEL SUPPLY COMPANY
USS
STEELS
SERVICE



UNITED STATES STEEL

Three "Tough Babies"

Mallory Electrical Contacts of Elkonite*



Free the Valiant...
Speed Victory...
Buy War Bonds!

Typical Physical Properties

ELKONITE G-12

Grams per cc	11.8
Lbs. per cu. in.	.42
Conductivity %I.A.C.S.	57-63
Rockwell Hardness	55-65B
Tensile Strength psi	35000
Cross Breaking Strength psi	70000

ELKONITE G-13

Grams per cc	12.3
Lbs. per cu. in.	.45
Conductivity %I.A.C.S.	55-60
Rockwell Hardness	70-80B
Tensile Strength psi	40000
Cross Breaking Strength psi	115000

ELKONITE G-14

Grams per cc	13.2
Lbs. per cu. in.	.48
Conductivity %I.A.C.S.	40-45
Rockwell Hardness	95-102B
Tensile Strength psi	60000
Cross Breaking Strength psi	130000

THE most complex problems that industry has to offer are daily solved by Mallory metallurgical engineers. Many of these problems concerning contacts are being answered by the use of Elkonite G-12, G-13 and G-14, three of the toughest members of the Mallory family of alloys.

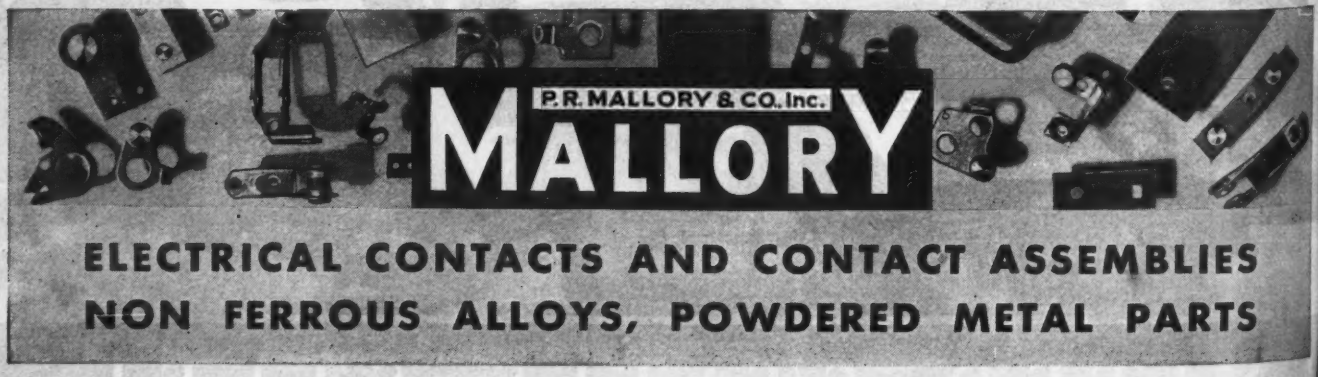
Fabricated from powdered metals, these contacts are notable for sustained low resistance and for excellent qualities of mechanical wear. In addition, they are practically immune to electrical erosion.

Electrical contacts made of Elkonite G-12, G-13 and G-14 have a wide field of application—from heavy duty circuit breakers to relatively low current aircraft switches and relays. One Elkonite G-13 contact, now in use, successfully interrupts 35,000 amperes at 400 volts. Others are required to operate at near-red heat over long periods of time. Even under these conditions, they function without evidence of harmful results.

If your application calls for contacts of unusual characteristics, or for performance under unusual conditions, perhaps Elkonite will meet your requirements. In any case, bring your problem to Contact Headquarters —Mallory engineers will be glad to help. Meanwhile, write for your free copy of the Mallory Contact Data Book and the Mallory Contact Catalog.

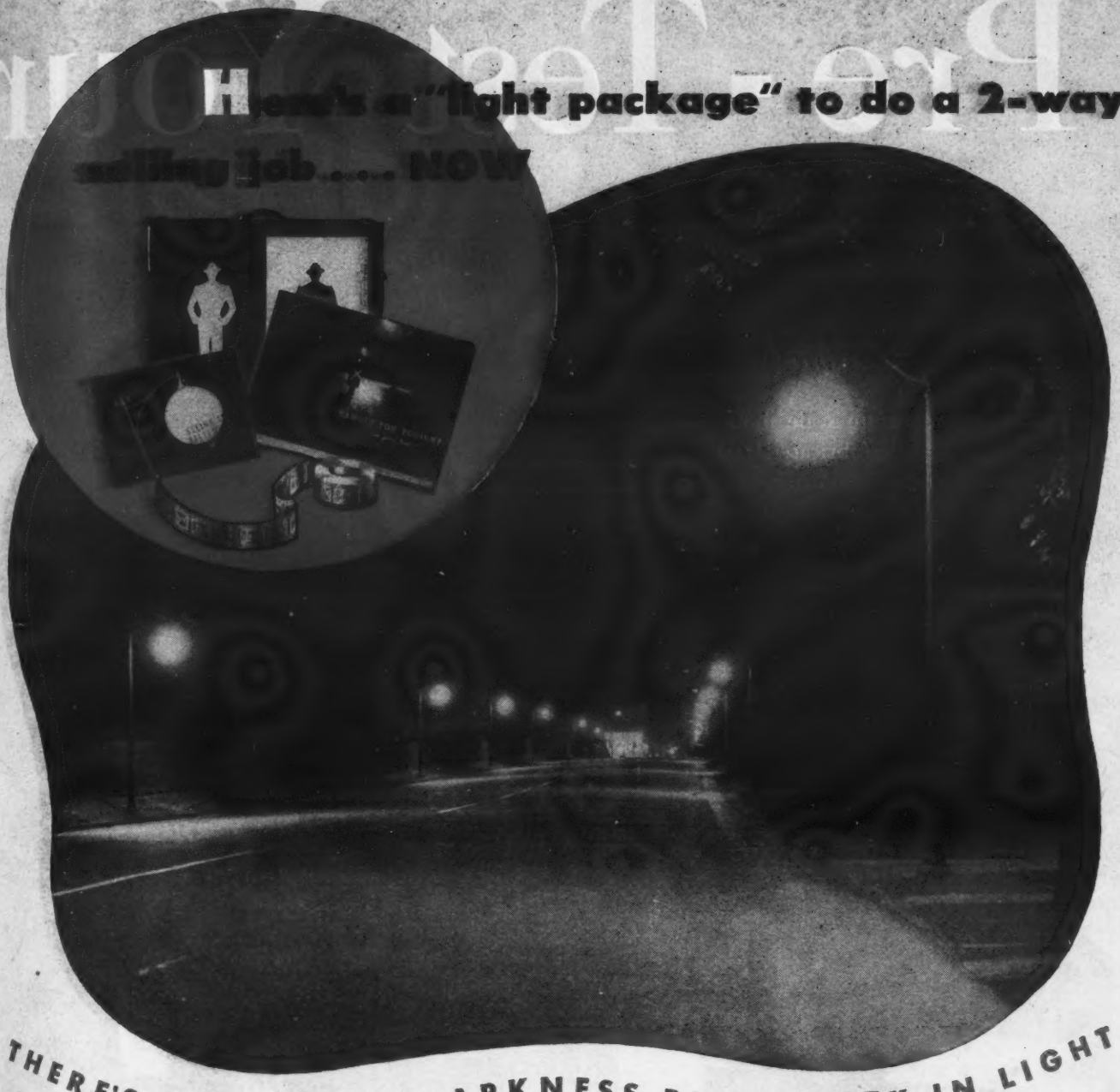
*Elkonite is a registered trademark of P.R. Mallory & Co., for refractory metal compositions

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA



ELECTRICAL CONTACTS AND CONTACT ASSEMBLIES
NON FERROUS ALLOYS, POWDERED METAL PARTS

Here's a "light package" to do a 2-way selling job..... NOW



THERE'S DANGER IN DARKNESS BUT SAFETY IN LIGHT

Now is the time to start planning for adequate Public Safety Lighting ::: and Westinghouse is ready now with a new package of promotional helps to dramatize the need of improved street lighting to both the public and municipal executives.

This "light package" includes carefully-planned meeting guides for demonstrations before civic groups ... sound slide films, charts, educational material, plus the services of Westinghouse Lighting Specialists.

Many utilities are now studying the problem of improved Public Safety Lighting as a means of creating public good will ::: an important contribution to solving community hazards of accident fatalities and juvenile delinquency.

Join the fight for better light ::: do it now. Write your nearest Westinghouse office today, or write Westinghouse Electric & Manufacturing Company, P. O. 868, Pittsburgh 30, Pennsylvania. J-04017

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

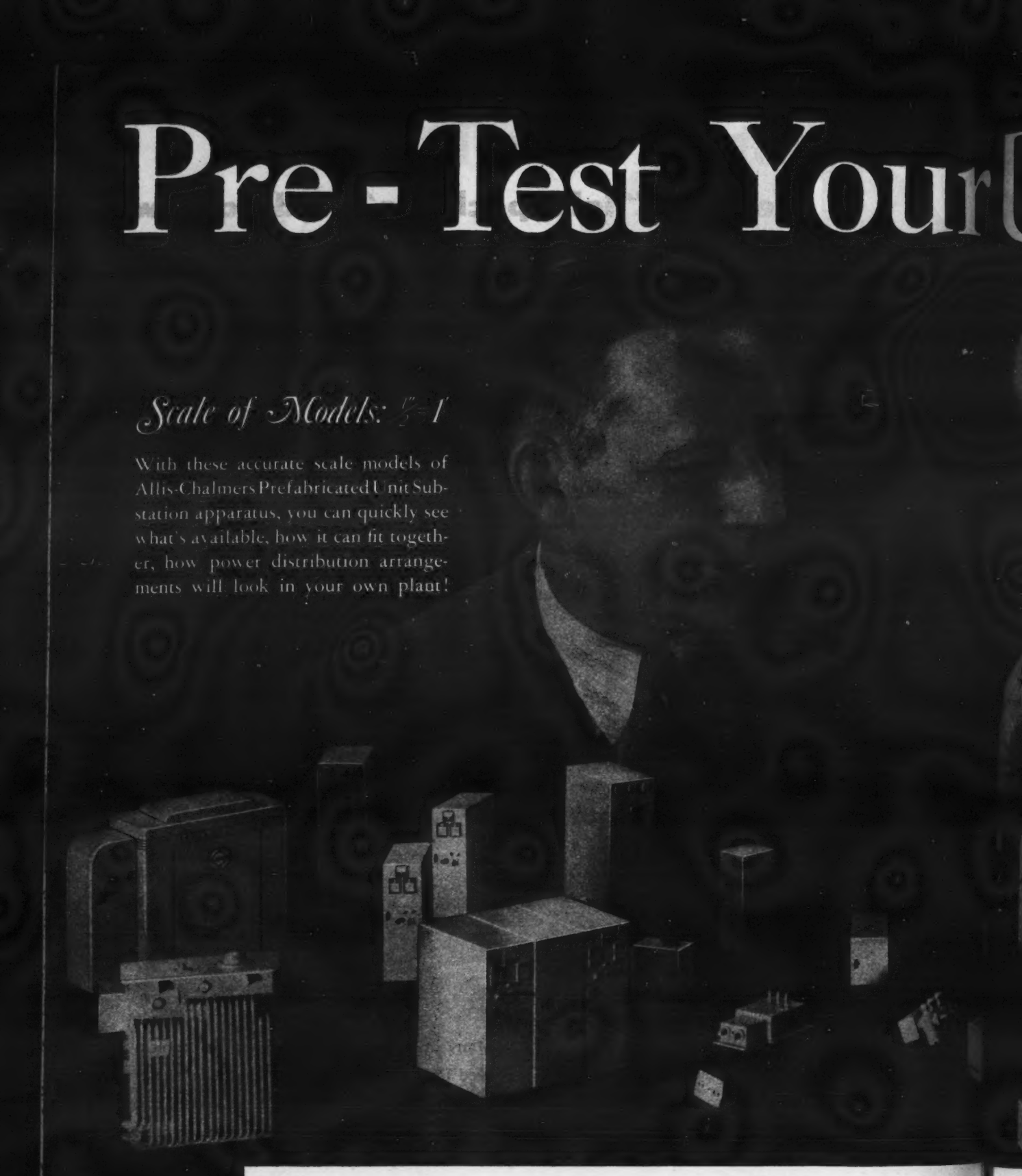
lighting division

PUBLIC SAFETY LIGHTING HEADQUARTERS

Pre-Test Your

Scale of Models: ½" = 1'

With these accurate scale models of Allis-Chalmers Prefabricated Unit Substation apparatus, you can quickly see what's available, how it can fit together, how power distribution arrangements will look in your own plant!



IT'S SO SIMPLE, so practical, so fast—*visual planning* of substations with Allis-Chalmers' new "Unit Sub Builder" Set!

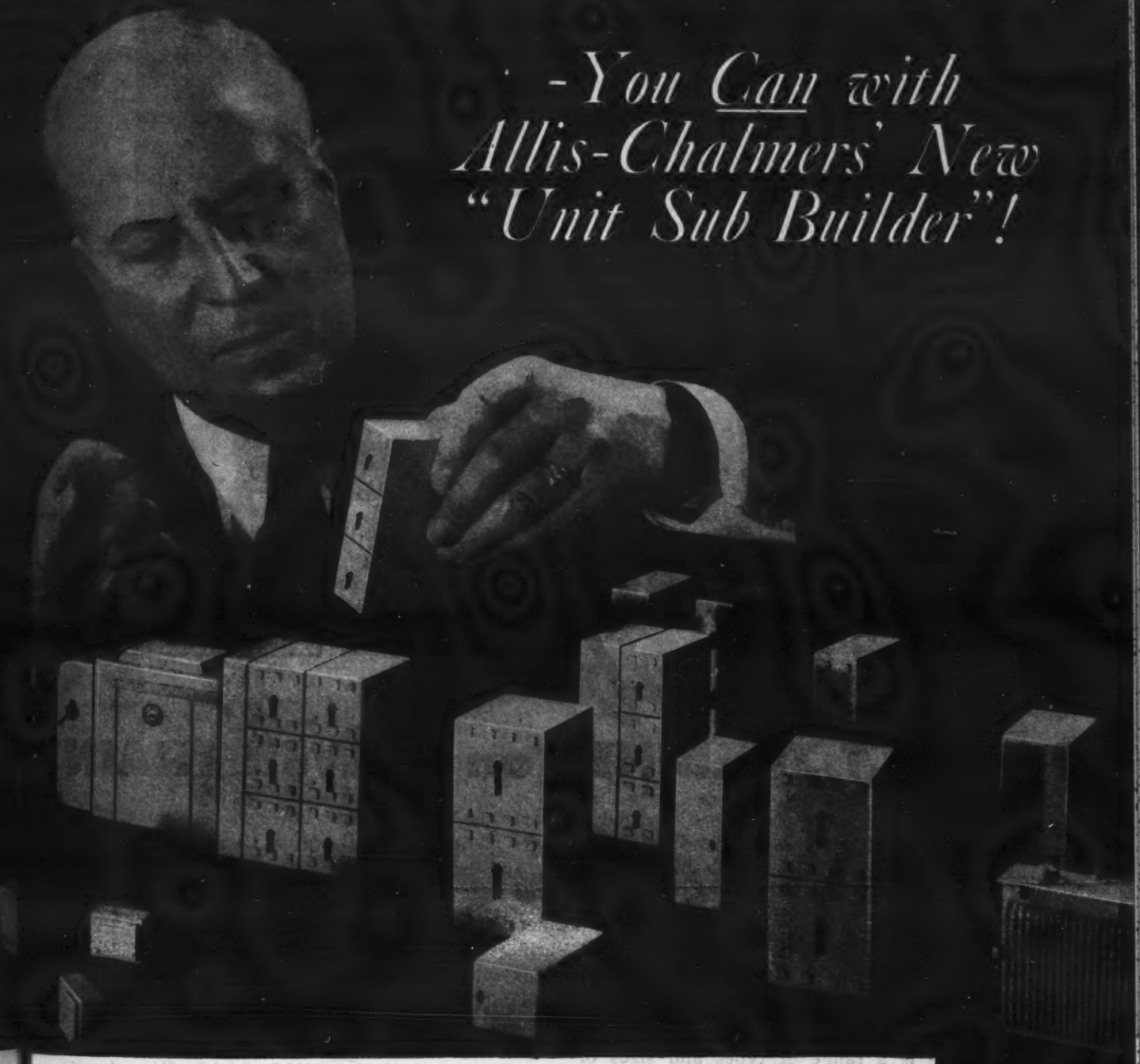
And it's good insurance — you *pre-test* your ideas — *see* just what you're getting in terms of dimensions, characteristics, appearance.

Here are the elements Allis-Chalmers Prefabricated Unit Substations are made of — in accurate scale models — plus a new "Unit Sub Slide Rule" to simplify breaker calculation, a new "Unit S Check List" to give you the added planning s of a *double* check.

Right on the top of your desk you can build all possible solutions to your power distribu problems — compare them from every point view. For the ultimate in visualization, you have a floor plan of your factory drawn to same scale as the models — ½ inch to 1 foot

Unit Sub Ideas

-You Can with Allis-Chalmers' New "Unit Sub Builder"!



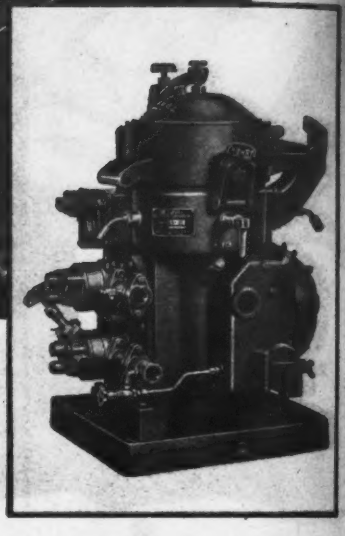
and build up your unit sub *right where it will stand!*

This new service is yours with *no obligation.* Call your nearby Allis-Chalmers district office for a demonstration of the new "Unit Sub Builder", by an Allis-Chalmers field engineer. ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WISCONSIN.

• • • A 1747

Tune in the Boston "Pops", Blue Network, every Sat. Eve.

Work Out Your Ideas with
ALLIS-CHALMERS
"Unit Sub Builder" Set!



Drawing courtesy Westinghouse Electric & Manufacturing Company

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MOVING swiftly into a village ravaged by war, this Westinghouse Power Train quickly provides all the equipment of a full size power plant of 5000 kilowatts. It can produce its power output in temperatures as low as –40° F., and usually must operate under conditions demanding a minimum of attendance or supervision.

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There is a range of types and sizes of De Laval Oil Purifiers to assure the proper machine for every power plant. Write for detailed information, sent without obligation.

THE DE LAVAL SEPARATOR COMPANY
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FOR MORE DEPENDABLE POWER PRODUCTION

1. Twin ingots of aluminum.

2. Rolled by experts in this giant, modern mill.

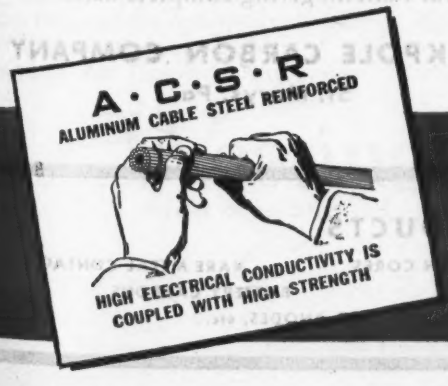
3. Large coils result in long lengths of cable.

A.C.S.R. owes its fine quality to this good start in life

More than a million miles of A.C.S.R. (aluminum cable, steel reinforced) now span the nation. Over a quarter century of service on rural and hi-lines testify to the great dependability and economy of Alcoa A.C.S.R. ALUMINUM COMPANY OF AMERICA, 2138 Gulf Building, Pittsburgh 19, Pennsylvania.

5. Stranded into cable, combining steel for strength and aluminum for high conductivity and long life.

4. Drawn into wire on a continuous draw bench.



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Other Stackpole types include carbon discs for electric brakes for trucks, speed governors—or wherever a little power must control a lot of power with utmost precision, smoothness, and dependability.

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(CARBON PILES)

Under impetus of war requirements demanding resistance adjustments for more critical, more precise, smoother, and more dependable control than is possible with conventional variable resistance units, Stackpole engineering has developed the Continuously Adjustable Carbon Rheostat formed of carbon disc piles to a high degree of efficiency. Simply by changing the pressure applied to the pile, every possible resistance value within its range is available without opening the electrical circuit in which it is connected. The pressure to vary the resistance to the most critical adjustment may be applied electrically, mechanically, centrifugally or hydraulically. Uses range from both generator and line voltage regulator applications to remarkable speed control through governed field current on motors. Many other projects incorporating the Carbon Pile Resistor are now in the development stage.

Stackpole regularly supplies Carbon Piles in practically any length pile and diameter required. Resistance ranges have been materially expanded and a greater degree of resistance variation may now be obtained in a pile of a given size. Careful engineering control of manufacture assures a high degree of uniformity on a quantity production basis. Write for bulletin giving complete data.

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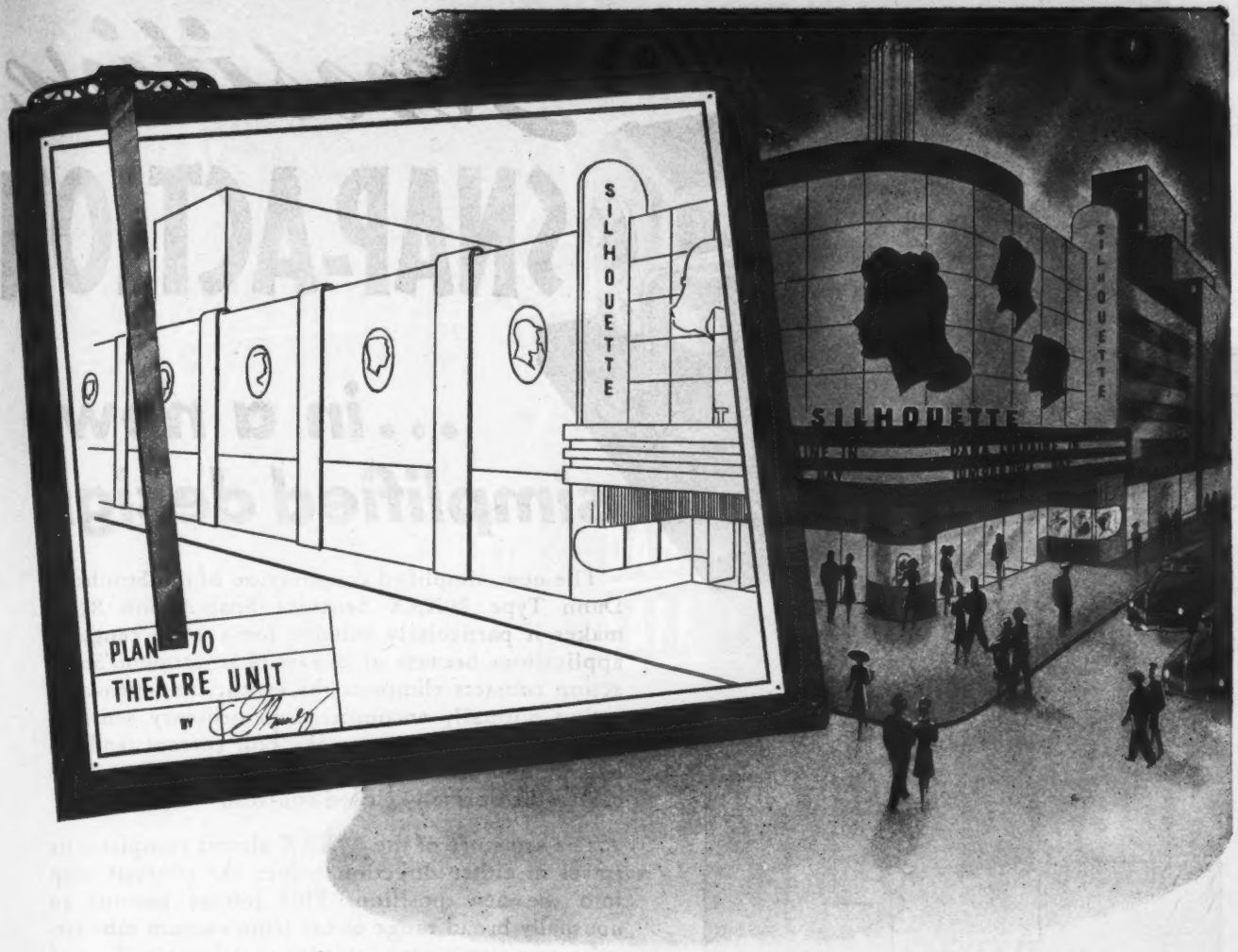

Tomorrow's Increased Power Uses

are on Architects' Drawing Boards Today

Theatres were among the first commercial enterprises to use the patron-pulling power of air conditioning. Yet, today's air-conditioned theatres represent only an estimated 20% of the nation's total.

This leaves a potential 80% — a large proportion of which are planning to install air conditioning as soon as possible.

Many power companies are planning increased load capacity to take care of the countless potential users of Modern Air Conditioning in business and industry. Others, fully equipped to handle it, welcome it as a load-builder.

Modern Air Conditioning means Westinghouse—and its years of pioneering research and engineering experience.

For essential war uses in factories, hospitals, airports, military bases, etc., Westinghouse Air Conditioning and Industrial Refrigeration Equipment is available today.

For executives, architects and engineers now planning postwar building and modernizing, dependable data and competent application engineering assistance are ready.

A new consumer booklet, "How To Plan Your Postwar Air Conditioning Today" will be helpful to commercial men when potential users ask their advice.

Phone your nearest Westinghouse office, or write on your letterhead to Westinghouse Electric Elevator Company, 150 Pacific Avenue, Jersey City 4, New Jersey.

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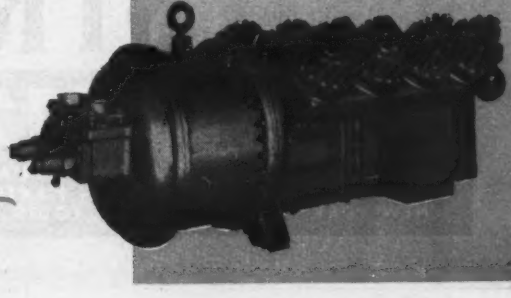
Westinghouse pioneered the Hermetically-Sealed Compressor. Hermetically-sealed means light weight · small size · low maintenance and operating costs · high efficiency · long life.



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Air Conditioning

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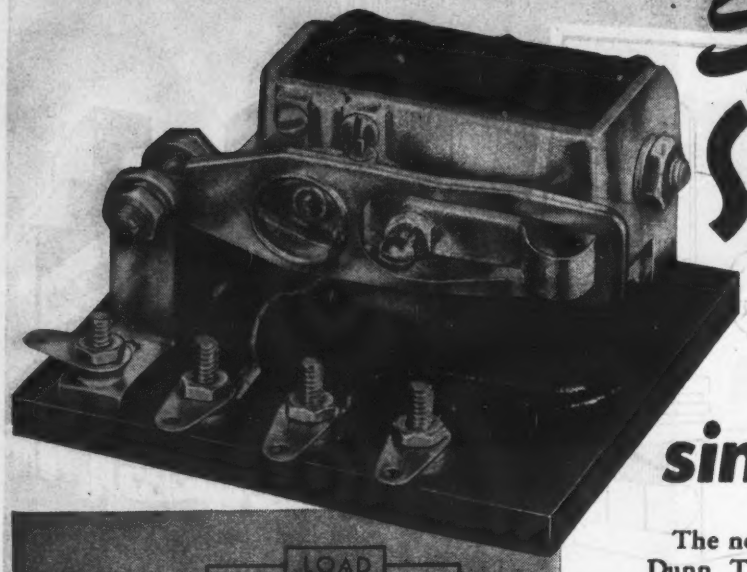


Sensitive SNAP-ACTION

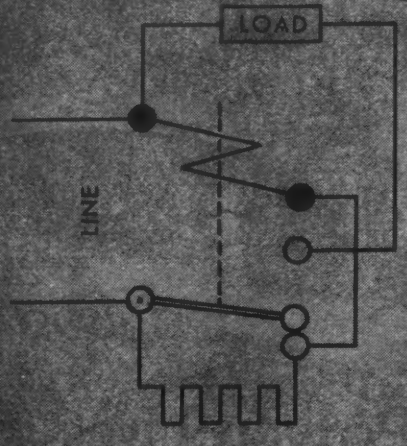
...in a new, simplified design

The new, simplified construction of the Struthers-Dunn Type 79XAX Sensitive Snap-Action Relay makes it particularly suitable for a wide range of applications because of its ease of adjustment. Snap-action contacts eliminate the erratic, undependable action normally encountered in ordinary sensitive relays when a slowly varying coil current tends to balance the armature tension spring, and to hold closed the normally closed contacts.

The armature of the 79XAX almost completes its travel in either direction before the contacts snap into the new position. This feature permits an unusually broad range of use from vacuum tube circuits, to overcurrent protection, pulsing circuits, and jobs where extremely close differential or extreme sensitivity of operation is required.

The standard adjustment using 60 ampere turns in the coil at approximately .02 watts results in contact pressures of 5 grams with contacts rated 5 amperes, 115 volts a-c; or 0.5 amperes, 115 volts d-c, non-inductive. Contact ratings up to 10 amperes, 115 volts a-c may be obtained with 100 or more ampere turns and a corresponding increase in power. A sensitivity of 0.005 watts, with 30 ampere turns, is obtainable with reduced contact pressures and ratings, and at an increase in price of the unit.

STRUTHERS - DUNN INCORPORATED
1321 ARCH STREET, PHILADELPHIA 7, PA.



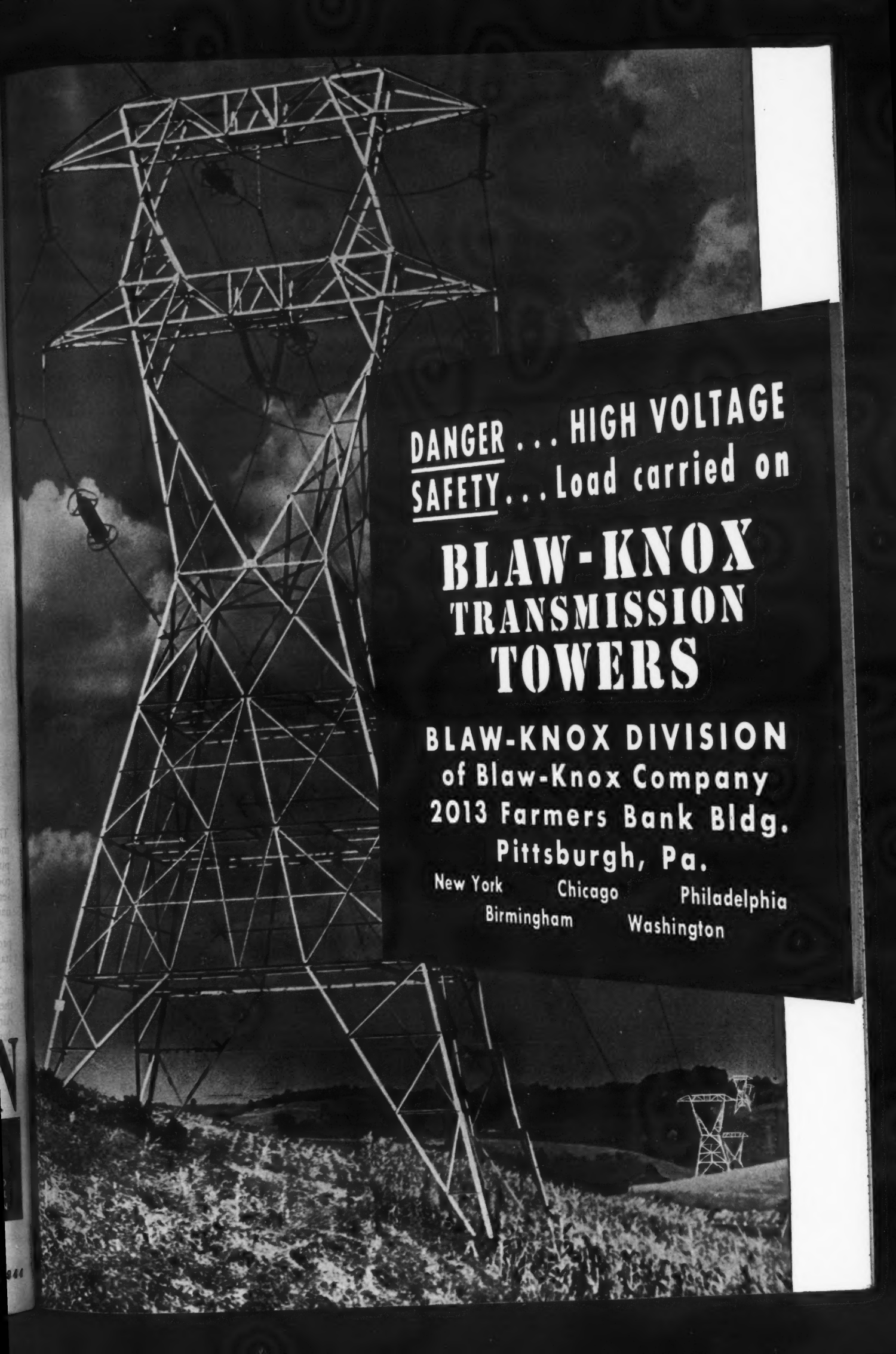
A TYPICAL CLOSE DIFFERENTIAL APPLICATION

In using the Struthers-Dunn 79XAX Relay, extremely close differential between pick-up and drop-out may be obtained for potential operation as shown above. The resistor is chosen so that, when the armature closes, the coil current is automatically reduced to a value just sufficient to hold it closed. Any further decrease in voltage will cause the relay to return to its normal de-energized position as shown.

STRUTHERS-DUNN

5,312 RELAY TYPES

DISTRICT ENGINEERING OFFICES: ATLANTA · BALTIMORE · BOSTON · BUFFALO · CHICAGO · CINCINNATI · CLEVELAND · DALLAS · DENVER · DETROIT · HARTFORD · INDIANAPOLIS · LOS ANGELES · MINNEAPOLIS · MONTREAL · NEW YORK · PITTSBURGH · ST. LOUIS · SAN FRANCISCO · SEATTLE · SYRACUSE · TORONTO · WASHINGTON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SAFETY . . . Load carried on
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BLAW-KNOX DIVISION
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"Sherarduct" Rigid Steel Conduit is a rustproofed electrical system built to resist rust, acids and corrosion.

Particular production methods are used pertaining to the threads —both the conduit and couplings have clean cut, rustproofed threads. Once installed, "Sherarduct" insures complete protection, eliminating pin hole rust spots on the threads which in time endangers the life of any permanent conduit system. Use "Sherarduct" Rigid Steel Conduit on your next job. It withstands the test of time.

SHERARDUCT

RIGID STEEL CONDUIT

National Electric Products Corp.

NATIONAL ELECTRIC PRODUCTS — WIRING SYSTEMS — WIRES AND CABLES

Pittsburgh, Pa.

Electrical World
NOVEMBER 25, 1944

Labor's Place

A REPRESENTATIVE of organized labor was critical the other day of our national adequate wiring standards as not being sufficiently complete to take care of the modern post-war home. This labor leader wanted the standards higher.

Besides recognizing that the public would get a better job and pay less in the long run, his interest was in the greater number of labor hours, just as the manufacturer is interested in more materials and devices and the utility in more kilowatt-hours. How great is labor's stake? A hasty survey of some pre-war estimating data shows that materials cost around 40 percent and labor around 30 percent of the cost to wire a home adequately.

At the present time the national adequate wiring work is being paid for entirely by the manufacturers who are members of NEMA, while most of the local promotion is being paid for by the utilities largely through local electric leagues, with the contractors and wholesalers also contributing locally to this work. Labor, however, has not contributed, not because it has been unwilling but because industry thinking has not matured to the point where labor was recognized as an integral part.

Are we ready yet to accept labor as a partner in the development of the electrical market? Probably not entirely because habit and prejudice are hard to change. However, progress is being made, the most significant being the adoption by NEMA at its recent annual meeting of the Declaration of Electrical Interdependence, at which time the necessity for keeping labor informed on the industry's programs was recognized.

It has always been felt that the employer was responsible for sales programs and market promotion and, since the costs are recognized as legitimate operating expenses and therefore are borne ultimately by the customer, there are good reasons for maintaining that precedent. However, that does not mean that labor cannot help in market promotion in some way other than financial. As a matter of fact, labor can become the strongest promotional factor for adequate wiring and electrical living if the right effort is made to get that support.

Labor has indicated that it would welcome an opportunity to work with the rest of the electrical industry in the development of the electrical market and when plans are being made, would like to participate in their formulation. Since one of the major reasons for this planning is to provide for employment, it does not seem at all strange for labor to be interested.

We have used adequate wiring only as a model to indicate how all elements of this industry that have a market stake can work together for the common good. There are many avenues which management and labor might well explore together without impinging on wages or working conditions. And it is not at all unlikely that if this exploration were made in the proper spirit much good would come, not the least of which would be a better and more constructive attitude around the bargaining table.

If labor can help in promoting the post-war market, and we think it can, then everything within reason should be done to secure its cooperation. It's a big job and we need every shoulder to the wheel.

Counterpoise Grounding Protects High Voltage Lines

No outages experienced on 150 miles of 110- to 220-kv. lines built since 1940—Generous counterpoise installations applied to 1,000 miles of troublesome lines in Quebec

A. S. RUNCIMAN, † Shawinigan Water & Power Co., Montreal, Quebec*

ADDITION OF LONG, practically continuous counterpoise grounding with special supplementary grounding in high resistance soil has effectively reduced outages caused by lightning. There has not been one lightning outage on 150 miles of suspension insulated and counterpoised lines built during or since 1940. Meanwhile lightning outages have decreased as counterpoise has been installed under 1,000 circuit miles of other lines. All these lines have two or more overhead shielding (sky) wires. Whether the counterpoise alone will give adequate protection is something still to be determined. Ample data is, however, available to substantiate the gains when counterpoise is added where sky wires already exist. (Fig. 1).

Successive Measures

The Shawinigan Water & Power Co. in 1930 commenced installation of radial short counterpoise wires about 50 ft. in length attached to the four legs of the 165-kv. tower line, between Quebec and Ile Maligne. The two circuits on this tower line, 137 miles long, were acting quite badly. The insulation was 10 suspension units only. (Fig. 2). The tower grounding was in gravel and rock, and now known to be high resistance. This gravel and rock is the result of the retreat of the glacier centuries ago.

The 50-ft. counterpoise wires produced no noticeable improvement. Next, long single ground wires were tried with short ground rods, 8 ft. long, at intervals. These rods could only be driven diagonally on account

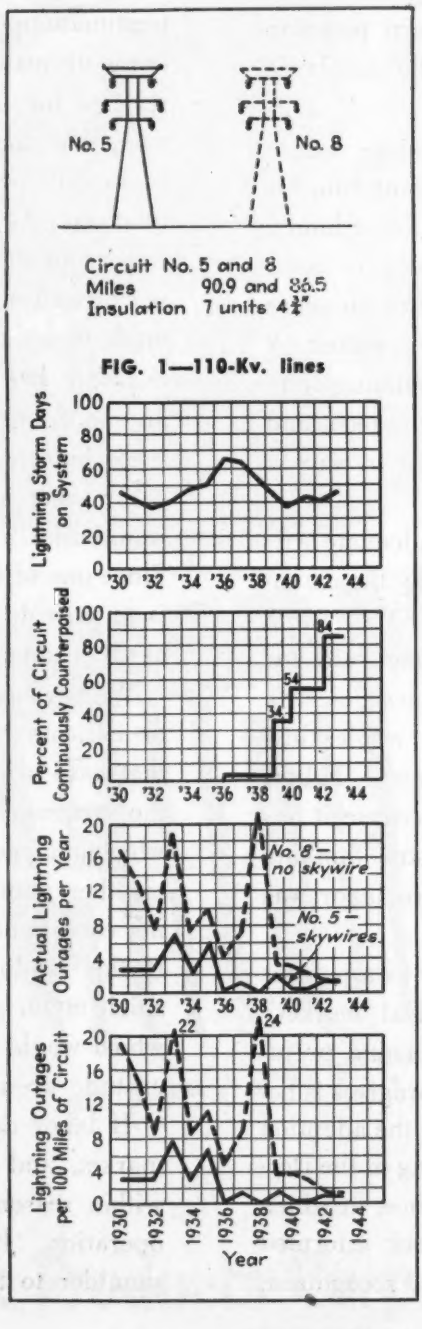

No. 5
No. 8
Circuit No. 5 and 8
Miles 90.9 and 86.5
Insulation 7 units 4¾"
Lightning Storm Days on System
Percent of Circuit Continuously Counterpoised
Actual Lightning Outages per Year
No. 8 — no skywire
No. 5 — skywires
Lightning Outages per 100 Miles of Circuit
Year

FIG. 1—110-Kv. lines

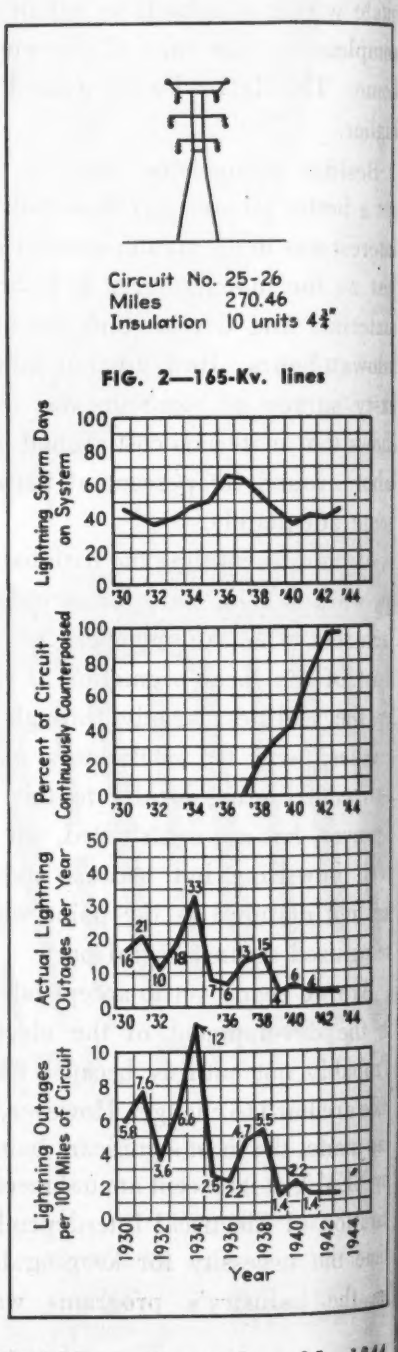

Circuit No. 25-26
Miles 270.46
Insulation 10 units 4¾"
Lightning Storm Days on System
Percent of Circuit Continuously Counterpoised
Actual Lightning Outages per Year
Lightning Outages per 100 Miles of Circuit
Year

FIG. 2—165-Kv. lines

* Superintendent of Transmission Lines.

† Adapted from paper at meeting of Canadian Electrical Association.

FIG. 3—Plough sets 0.207-in. electrogalvanized wire 18 in. underground

of the rocky, gravel soil. A careful study of the towers which flashed over did yield the idea that the flashes were less and sometimes nil in the middle of a long run of buried wire.

This idea was developed by digging in two wires, one on each side of the tower line, for long stretches, about shovel depth and connected to tower legs. These runs, several miles long, showed that towers in the middle appeared to be immune from flashover. Flashovers still occurred on towers within 1,000 ft. of the end of the buried wires.

Plough Enters Scene

About the year 1936 the counterpoise plough was being developed.

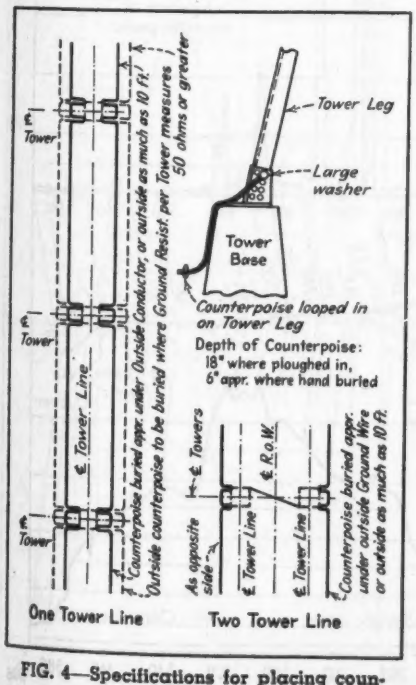

℄ Tower
℄ Tower Line
℄ Tower
℄ Tower
Outside counterpoise to be buried where Ground Resist. per Tower measures 50 ohms or greater
Counterpoise buried appr. under Outside Conductor, or outside as much as 10 ft.
Tower Leg
Large washer
Tower Base
Counterpoise looped in on Tower Leg
Depth of Counterpoise:
18" where ploughed in,
6" appr. where hand buried
℄ Towers
℄ R.o.W.
As opposite side
℄ Tower Line
℄ Tower Line
Counterpoise buried appr. under outside Ground Wire or outside as much as 10 ft.
One Tower Line
Two Tower Line

FIG. 4—Specifications for placing counterpoise wires on one and two tower lines

The plough was designed to place the wire underground after it had been stretched out.

Later, when it was found that tractors were required for the hard ground, a reel was mounted on the rear of one tractor and the wire fed to the plough. (Fig. 3).

High Resistance Regions

In 1942 a flash occurred on a 110-kv. line which had been counterpoised and it proved to be attributable to inadequate grounding or reflection at a tower on rock on the river bank.

Other lines showed the same trouble when connected to double buried counterpoise. This information, while discouraging, was constructive. It was kept in mind during construction of a 70-mile 220-kv. line insulated by 14 suspension insulators. (Fig. 6). This line, while under construction, permitted measurement of the ground resistance of each tower base. It was noted from the study, which was made before any sky wires or counterpoise wires were in place, that steep slopes caused the steel tower footings to read high resistance to earth. This was probably due to the rain washed soil on the slopes, that is, all salts or soluble conducting materials were probably dissolved or leached out by rains. This high resistance soil effect was also noted near rivers, especially in the banks of the old rivers. (Fig. 7). There was found one newly formed post-glacier river, the Batiscan, which ran through a clay deposit which did not show the high resistance effect.

Groups of adjacent towers indicate high resistance and it was decided to correct this by ploughing in two extra

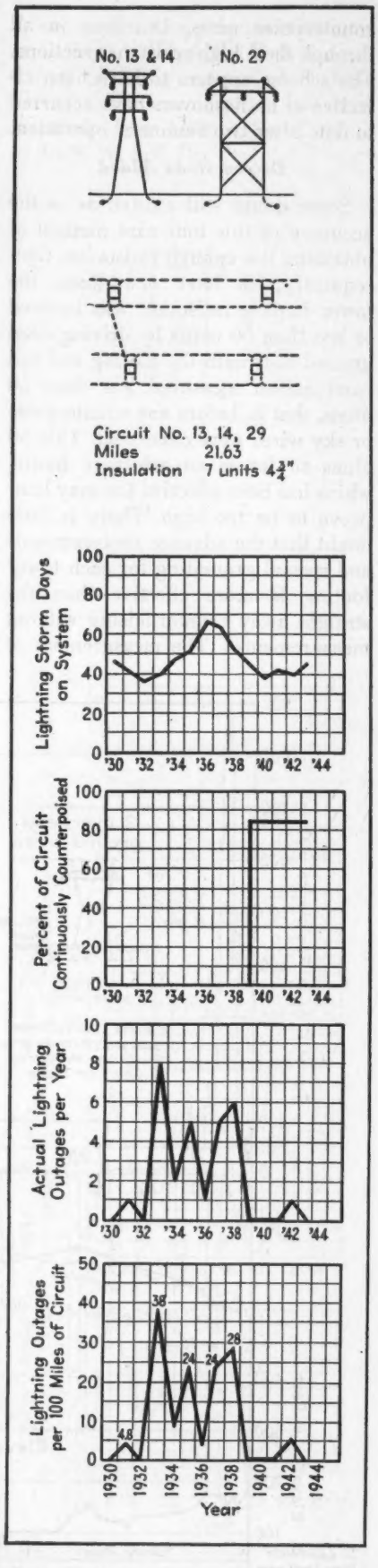


FIG. 5—Exceptional outage reduction on 110-kv. lines counterpoised near power house terminals. Details of circuits and counterpoising shown

counterpoise wires, i.e., four in all through these high resistance sections. The scheme appears to have been effective as no flashovers have occurred to date after two summers' operation.

Driven Rods Added

Some doubt still existed as to the accuracy of this four-wire method of obtaining low enough resistance. Consequently, on later new lines, the tower footing resistance was lowered to less than 50 ohms by driving deep ground rods until the footing and rod combination measured less than 50 ohms, that is, before any counterpoise or sky wires were connected. This 50 ohms so far is an arbitrary figure, which has been effective but may later prove to be too high. There is little doubt that the advance measurements and special grounding for each tower footing is more effective than the straight away counterpoising without measurements. The measurement of ground resistance of towers after a line is in operation is difficult and almost impractical, especially in the case of the dead-end towers. Tangent line towers can be measured for ground resistance by lifting the sky wires but this is not the simplest of jobs to perform.

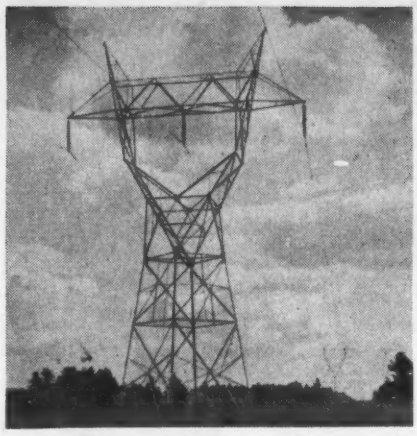


FIG. 6—Seventy-mile 220-kv. line (14 suspension units) had high resistance at the river-bank towers

The present scheme for improvement of the older two-wire counterpoised lines is to wait for the occasional flashover and make a special study of each flashed tower and add ground rods until the rods alone are down to 50 ohms before connection to the tower legs.

Lightning Discharge

Lightning current flow is uni-directional*, the electrons flowing from the cloud to the earth and some records show, for times as long as one-half second. This downpour of electrons seems to indicate that the lightning discharge of a heavily loaded cloud is similar to a cloud burst, and methods must be developed, therefore, which will dispose of this downpour of electrons as rapidly as possible

* "Wave Shapes of Successive Lightning", K. B. McEachron, ELECTRICAL WORLD, February 10, 1940.

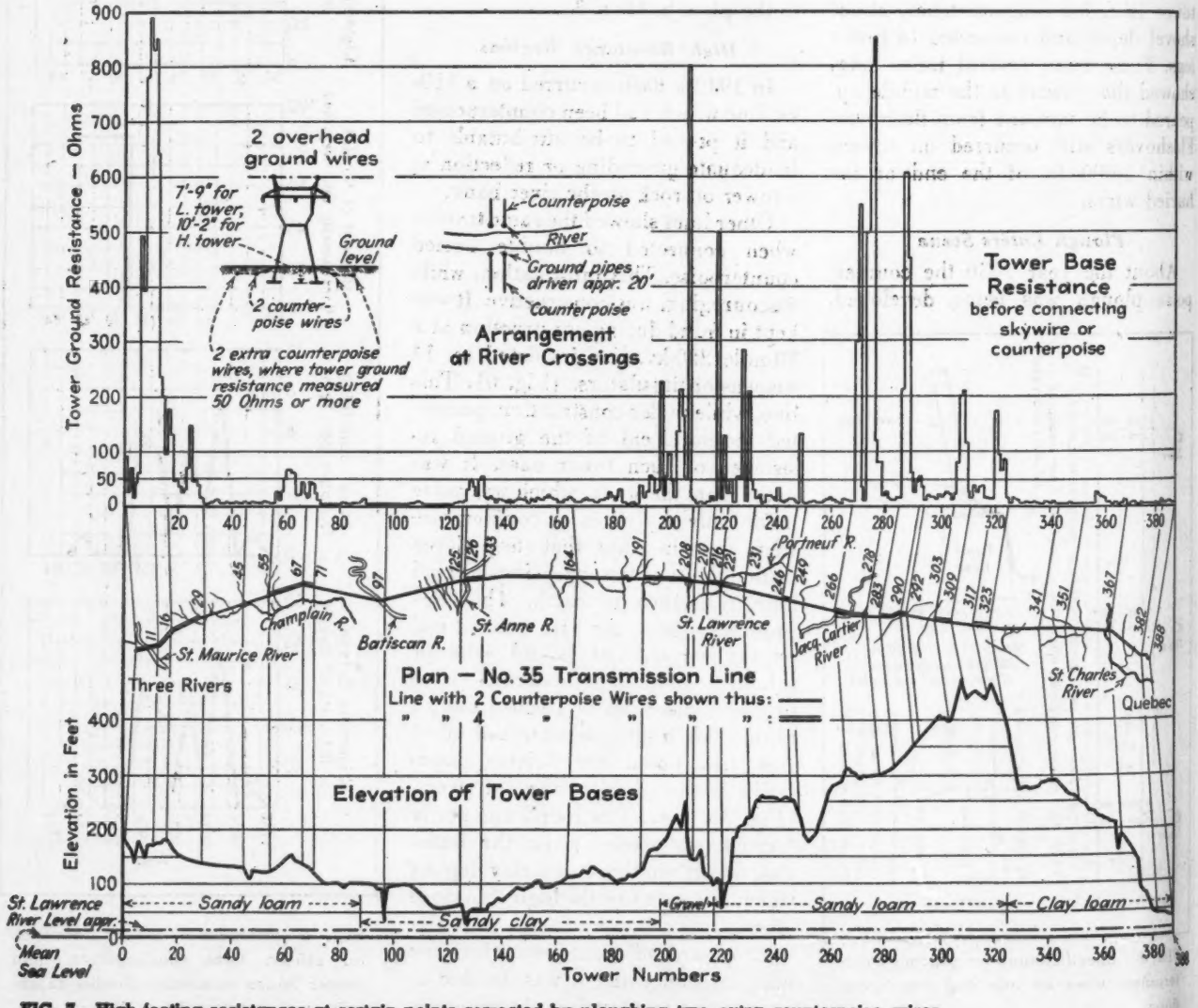


FIG. 7—High footing resistances at certain points corrected by ploughing two extra counterpoise wires

without breaking down the comparatively small insulation used on transmission lines. This calls for an extremely low resistance path to and in the earth to conduct this deluge of electrons past the line insulation, and this path must have no reflecting properties within long distances, such as 1,000 or 2,000 ft. of the point struck.

The long continuous counterpoise, with the addition of low resistance grounds at necessary locations, seems to accomplish the purpose effectively as indicated by graph (Figs. 8 A, B, C.) of lightning outages which have decreased as counterpoise has been installed under 1,000 miles of circuit of the S. W. & P. Co.

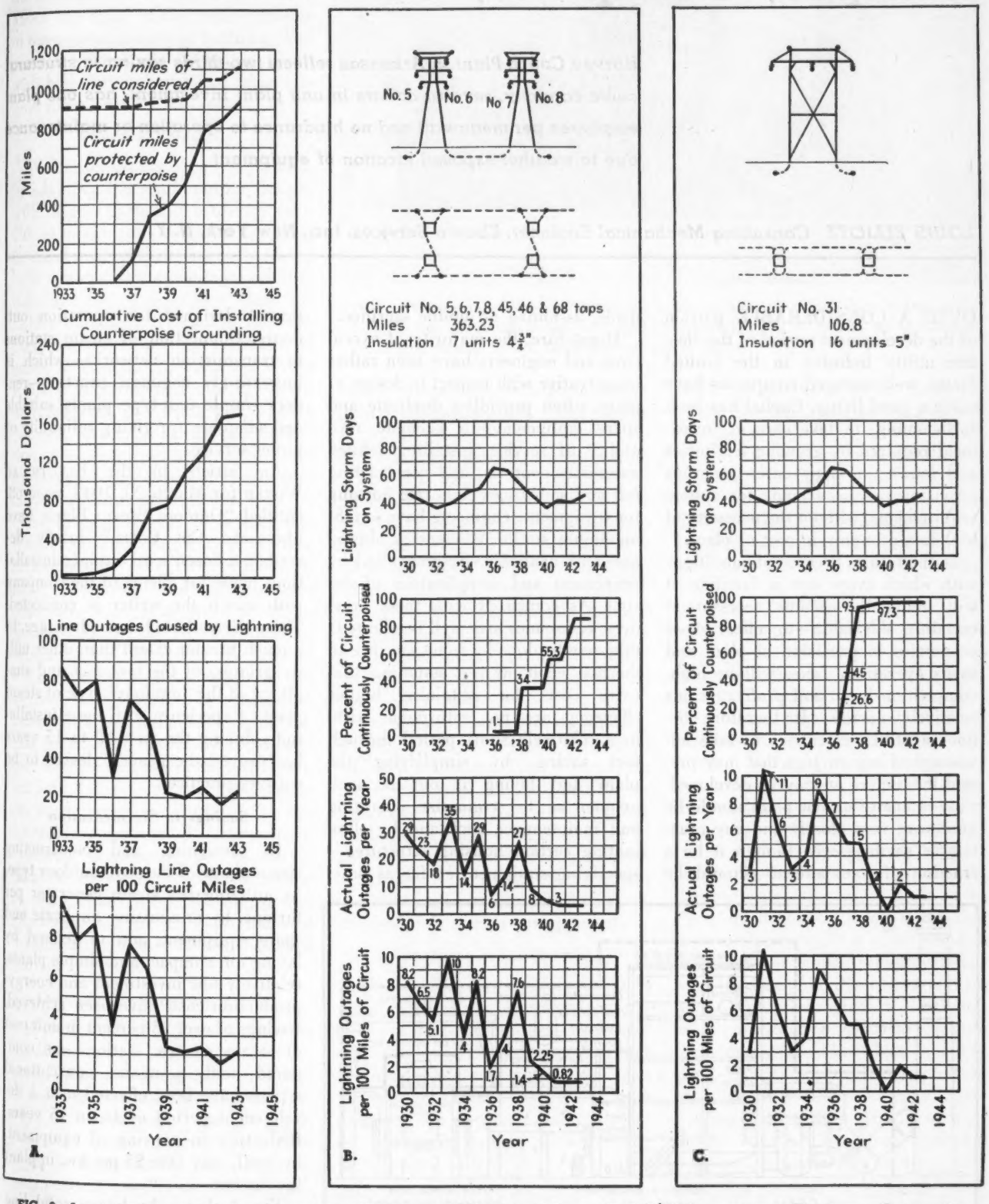


FIG. 8—Long continuous counterpoise proves effective on 1,000 miles of lines. A. 110/220-kv. systems. The more miles counterpoised the better the outage record. B. Lines totaling 363 miles with seven 4¾-in. units have sharp reduction in outage. C. 16-unit (5-in.) line 106.8 miles long has been reduced to less than 1 outage per 100 miles per year

Semi-Outdoor Plant Simple, Compact, Convenient

Harvey Couch Plant in Arkansas reflects two-thirds saving in structural cubic capacity, several dollars in unit plant investment, has one plant employee per megawatt and no hindrance to operation or maintenance due to weather-exposed location of equipment

LOUIS ELLIOTT, Consulting Mechanical Engineer, Ebasco Services, Inc., New York, N. Y.

OVER A CONSIDERABLE portion of the development period of the electric utility industry in the United States, well-managed companies have made a good living. Capital has been forthcoming, to take care of investment required by growing territories and loads; in many cases generous provision has been made for system requirements, without the necessity of too close economy in cost of plant.

In the future, because of conditions with which every one is familiar, it will frequently become necessary—certainly advisable—to effect close economies in provision of plant and in its operation. Taxes will be high, competition keen, and profit margins relatively narrow. It therefore behooves utility executives to take advantage of any savings that may present themselves or may be developed. Cost estimates of new plant should be gone over very closely and any practicable saving—even though it be a fraction of one percent—should be made, assuming no undue sacrifice.

Heretofore, the majority of executives and engineers have been rather conservative with respect to design of plant, often providing duplicate and spare equipment—to promote reliability of service, installing refined automatic controls, and constructing full and sometimes elaborate housing for equipment; engineers have sought maximum station efficiencies obtainable with available equipment and by refinement and complication of design. As compared with these practices, economies may well be effected; this may be done by some sacrifice in thermal economy — assuming that extra costs for obtaining higher efficiency are not returnable within a relatively short period through fuel saving, by simplifying the plant and laying it out in such manner as to economize operating and maintenance staff and by eliminating certain housing structures—specifying equipment so far as practicable designed for operation outdoors. Connection of steam stations to transmission networks—which is increasingly common practice—renders simple unit-type plants suitable and adequate, for giving reliability of power service.

An article in the ELECTRICAL WORLD for March 20, 1943, page 68, entitled "Outdoor Steam Plants Save Materials, Cut Costs," briefly described a dozen semi outdoor installations made for clients of the company with which the writer is connected. These clients have taken advantage, to a much greater extent than other utility groups, of the low cost and simplicity of the "outdoor" type of steam plant. Experience with these installations during the past 10 to 15 years has proved the general design to be entirely practical.

Savings in Simplification

By designing and constructing steam plants of the semi-outdoor type, by utilizing one steam generator per turbine, by minimizing duplicate and spare equipment, and in general by laying out compact and simple plants, relatively low investment and energy-production costs have been achieved. Savings of over 25 percent in unit cost of steam electric stations—as compared with previous conventional types—have been effected over a development period of 10 to 15 years. Reduction in housing of equipment, by itself, may save $5 per kw. in plant investment.

Fig. 1 shows, by heavy solid line the approximate sectional outline of building provided for a 30,000-kw.

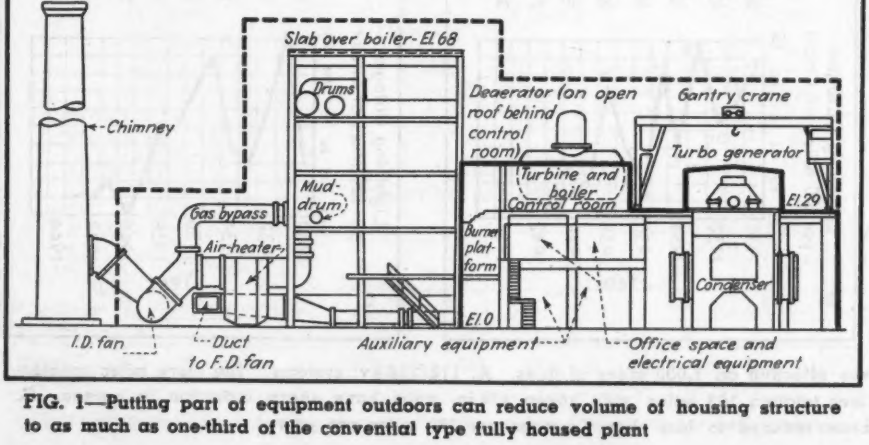


FIG. 1—Putting part of equipment outdoors can reduce volume of housing structure to as much as one-third of the convential type fully housed plant

station described below; also, by dashed line above, the corresponding building for a conventional fully-housed plant. Assuming length of plant (at right angles to plane of section) to be the same for both types, the semi-outdoor design contains only about one-third of the cubic contents of the conventional-type building. The contrast with usual fully-housed plant, with high boiler house and large turbine room, is quite marked.

Climatic Versatility

Discretion should of course be used, in adopting the semi-outdoor design, with respect to its suitability for various climatic conditions. With great frequency of violent storms or long cold winters, the advantages of that type are less pronounced than for milder climates; they have however been successfully used, in a number of cases, in regions experiencing severe winters. It is impossible to lay down dividing lines, in climate and in other respects, determining proper utilization of semi-outdoor designs; decision as to type becomes a matter of judgment, weighing all elements.

By proper design, it is possible, with the semi-outdoor station, to carry on a very large proportion of the ordinary operating and maintenance processes, with men protected from the weather. In the unusual event of necessity for carrying on certain major maintenance or repair in inclement weather, such as removal of generator rotor, temporary protection may be afforded the men without serious difficulty. No reports have been received, from client utility executives or power superintendents, as to unfavorable reactions of construction, operating or maintenance men. No indications have been had that this type of plant receives less consistent and effective attention, in operation and maintenance, than the fully-housed station.

Example of Simplified Design

A good specimen of a semi-outdoor installation, and one of the most recent, is a new steam station built during 1943 in Arkansas, named the Harvey Couch in honor of the late president and founder of the company. The plant is rated 30,000 kw. (net output); steam conditions are 650 psi. and 825 deg. F. Steam generator is outdoors, protected by roof slab and with firing aisle housed; turbo-generator is on an open deck protected by light sectional housing. The outline section shown in Fig. 1 indicates general arrangement of major equipment.

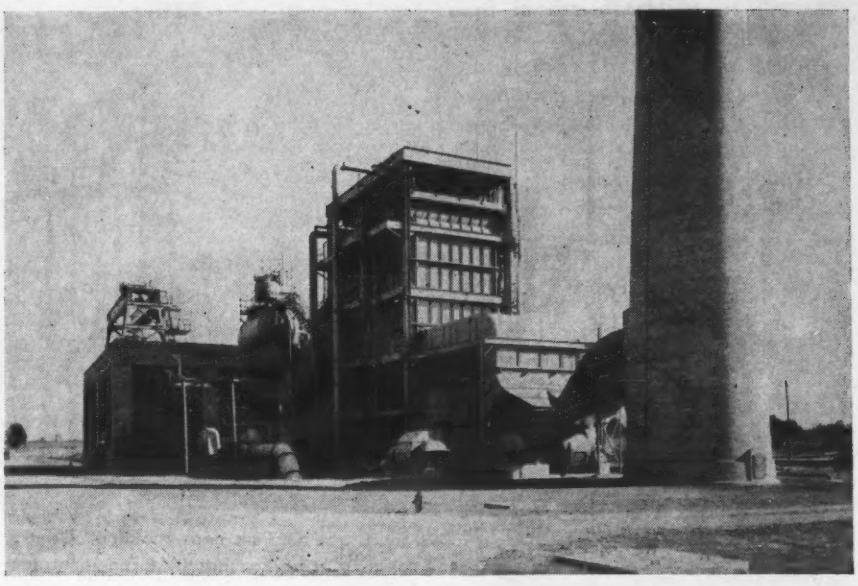


FIG. 2—Steam generating unit unhoused in foreground; air-heater and outdoor draft fans. At left circulating pump with discharge pipe leading to cooling tower. Gantry crane over turbine at left. Deaerator on roof of auxiliary bay

Fig. 3 is another exterior view of plant, with switching station in foreground, transformers near building, and gantry crane on turbine deck tramming over removable structure housing the turbogenerator; condenser is in building beneath. Control room is shown behind turbine housing and steam generator is in background. Still further in background is the cooling tower.

The illustrations reveal the simplicity of design, and small volume of building structure. This economy in use of structural materials and the selection of reinforced-concrete frame for building, instead of steel, were of particular importance under wartime conditions. The possibility of saving in investment—as compared with usual design of station—is apparent.

Can Burn Sulfurous Gas

The location for the Harvey Couch plant was chosen a few miles from natural-gas fields in southwestern Arkansas, in order to take advantage of that fuel—available at relatively low cost. Gas produced by the nearby McKamie field is of the so-called "sour" character, and carries over 10 percent sulfur, as hydrogen sulfide. However, before delivery and sale to power company, the gas is "sweetened," with production of large quantities of sulfur. Valuable "condensate" is also extracted from the gas as it issues from the wells. The fuel value of the gas, utilized in production of electric energy, may in this case be considered as by-product. The plant is so designed as to burn the sour gas successfully, when desired. The chief precaution is to avoid condensation in cold end of airheater; this is done by bypassing.

Cooling Tower

In this region there are no streams suitable for direct-condensing service. However, the use of a cooling tower permitted selection of most economical site, taking into consideration rail highway transportation facilities, connection to company's transmission system, topography, foundation conditions, and living quarters for employes, as well as above mentioned fuel availability. In many of the cases calling for artificial cooling of condensing water, the forced-draft or induced-draft cooling tower is the best choice. Occasionally a spray pond is indicated, sometimes because of fear of tornadoes, but the forced- or induced-draft tower gives a closer and more consistent approach to wet-bulb air temperature than does a spray pond or a natural-draft tower; these have the further disadvantage of requiring much greater ground area.

The construction work included building a railway spur and entrance highway, sinking of wells, development of other facilities required, and general preparation of site and grounds. Ground was broken in

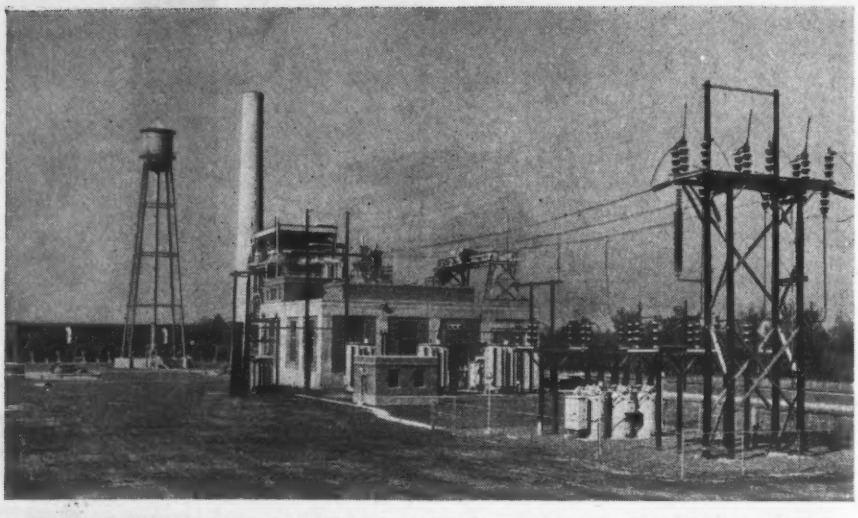


FIG. 3—Switching station located in foreground, transformers near building. Gantry crane on turbine deck, tramming over removable structure housing the turbo-generator. Cooling tower is shown in left background

July 1942, and the station was first fired up in August 1943. Had it not been for wartime conditions, with scarcity of labor and delays in receipt of material and equipment, entire construction program could have been completed in eight to nine months.

Starting and Testing

After completion of installation, the starting and testing program was begun. There were the usual defects and troubles in the apparatus and in its operation, most of them relatively minor. Included in these were the following: "hot spots" around furnace and boiler inspection doors and in casing, resulting from defects in casing and insulation, and causing leakage through soot-blower sleeves; breakage of link in operating mechanism of super-heater-bypass damper, and sticking of damper; vibration of forced-draft motor; vibration and bearing troubles in induced-draft fan; leakage through stud-bolt hole at low-pressure end of one boiler feed pump; sand-hold in second stage of another feed pump; unsatisfactory operation of evaporator feedwater level-control valve; defect in overflow valve on deaerating heater; defect in wearing ring of service-water pump; deficiencies in cooling-tower construction, with leakage from tower, and necessity for replacement of several of the plastic-type fan blades.

These are the usual "run-of-mine" troubles, none of them being serious. The chief difficulty in putting the plant in operation resulted from an obstinate unbalance in the turbo-generator, which it was found impossible to correct in the field, and which required shipping the turbine rotor back to factory. No defects in shaft or other elements that might affect the operation were discovered, and upon reinstallation of rotor the turbine ran quite satisfactorily. The manufacturer spared no pains or expense in correcting this trouble—which was presumably chargeable to wartime conditions.

Efficiency tests of major equipment showed that performance specifications had been complied with.

Plant Operation

The turbogenerator is rated 25,000 kw. at 0.8 p.f., 31,250 kw. at 1.0 p.f. with 0.5-psi. (gage) hydrogen and at 0.87 p.f. with 15-psi. hydrogen, at maximum back pressure normally expected and with full three-stage bleeding. The moderate steam conditions of 650 psi. 825 deg. F. were selected for this installation, because of low unit cost of fuel available. The boiler is a three-drum bent-tube, with airheater but no economizer. Natural gas is base fuel, with oil as reserve.

Heat balance of plant drawn up during design, indicated, for 25,000-kw. load with 2.25-in. back pressure, an economy of 13,300 B.t.u. per kw.-hr. net output, with 82 percent boiler efficiency. Actual operating results for an early month of this year, with subnormal steam temperature, with turbine back pressure somewhat lower than 2.25 in., and with steam-generator efficiency of 83 percent, showed approximately the heat consumption mentioned above.

For eight months following the beginning of regular operation, the station has been running at a capacity factor, based on 30,000-kw. rated maximum output, in excess of 93 percent, and at a load factor, based on 30,900-kw. maximum hour, of nearly 91 percent. It has been giving reliable service and producing low-cost energy.

Minimized Operating Staff

At Harvey Couch plant 25 men are employed, including four in office and on supervision, six on maintenance, and 15 on operation. In latter are included one janitor, one wiper and one yard man, the remaining 12 being shift operators—giving, with required allowance for relief, three regular operators per shift. One of these three is usually stationed in mechanical and electrical control room for control of turbine, boiler and auxiliaries, one is in pump room below, and a third does miscellaneous station work. Cross section of plant, Fig. 1, shows that location of control room is convenient to both steam and turbo-generators.

No difficulties have developed from the semi-outdoor character of plant. As indicated above, operators are housed during performance of most of the normal operating and maintenance operations. The sectional removable housing of turbine is sufficiently large to permit convenient access to machine for operating purposes, and removal of sections during overhaul is readily accomplished. During the somewhat extended starting and testing period, required for turbo-generator adjustments and other operations, as discussed above, full trial was made as to convenience in handling the turbine-housing sections.

Mr. Robert Bruce of Arkansas Power & Light Co. is in charge of this plant, as well as of other steam stations operated by that company. His long experience and systematic methods of operation and maintenance assure that best practicable performance will be obtained, and that plant will be kept on the line for maximum possible time during the year. Plant design was drawn by Ebasco Services Inc., consulting and designing engineers for Arkansas Power & Light Co., with the cooperation of Mr. C. S. Lynch, vice-president of the company, and Mr. R. R. Pittman, chief engineer. Mr. W. M. Wolford of the Ebasco organization acted as Construction Superintendent.

Board for Long Tests of Demand Meters

Accommodates all types—Discloses faulty tripping, clutches and incorrect time intervals

A. J. HOLTHAUS, Illinois Power Co., Belleville, Illinois

ILLINOIS POWER CO. has installed in each of its area meter shops, a demand-meter test board designed to prove demand meter accuracy beyond the short period of operation devoted to testing of the meter element.

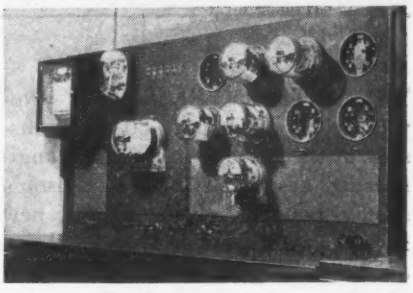
This board is so flexible, that it can accommodate any type of demand meter and, by comparing the indication with a calibrated recording instrument mounted permanently on the board, the demand meters can be operated under load conditions for a period of days. Any faulty conditions such as tripping failure, defective clutches, or incorrect time intervals, will show up in this length of time and the meters go out with less chance for failure.

Current for operation of the meters is obtained from an instrument transformer having its primary winding replaced by a low voltage winding, tapped for various current loads. The current circuit for self-contained meters is passed through a permanently mounted meter with contacts, to check contact type demand meters. Included in the same circuit are three current transformers with their primaries connected separately to the various taps of the loading transformer. The secondaries of these current transformers are connected in parallel to furnish current for operation of the recording demand meter and are brought to a set of terminals to allow connection of instrument transformer type meters.

Fifth Terminal Provided

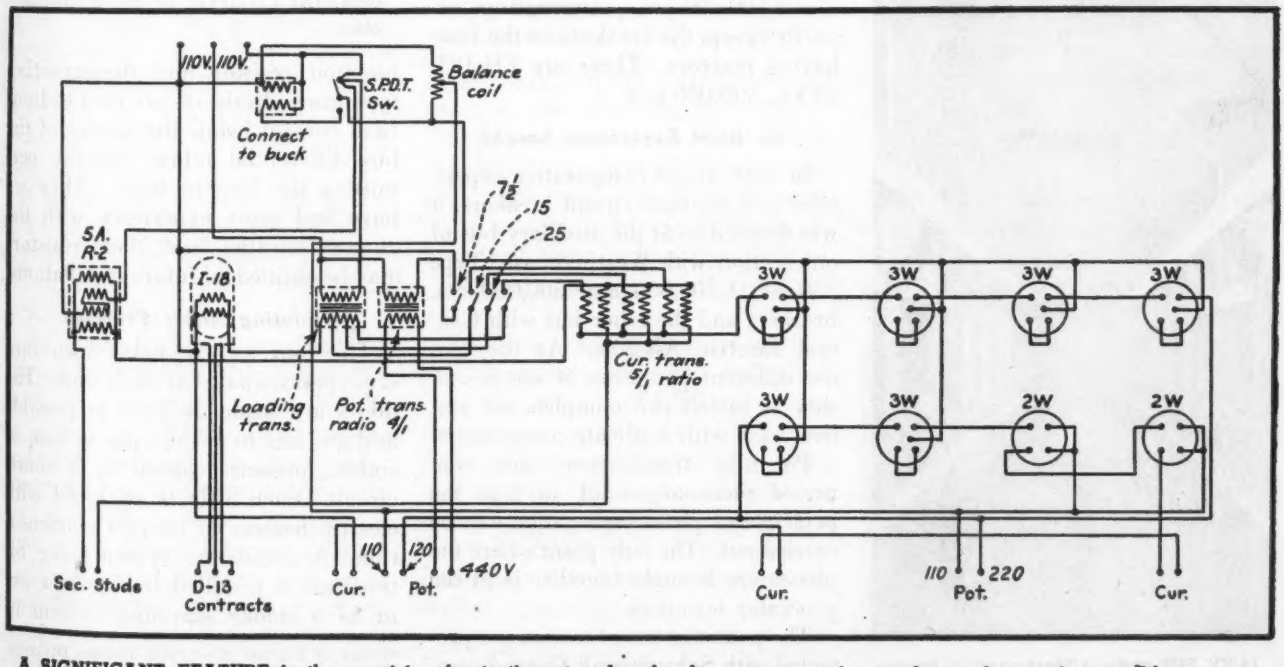
The potential circuit is arranged for all meters up to 440 volts. A fifth terminal for three-wire socket meters is mounted on presswood and installed in the meter sockets. Connections for "A" type meters are made with flexible leads to separate terminals.

An outstanding feature of this test board is the operation of demand meter motors at a reduced voltage to simulate the worst condition they may encounter in service. This is accomplished by the use of a small transformer with its secondary connected to reduce the voltage to approximately 85 percent of line voltage. By the use of a balance coil in this circuit the same percentage of voltage reduction is obtained in both 115 and 230 volts potential. Experience has proven that if the motors will perform satisfactorily with the reduced voltage on the test board, failures in service will be very few.



PROVISION is made for shop-testing demand meters of various types for prolonged intervals of time

These test boards have been in operation for two years and during this period have proven their merit through the elimination of numerous customers' complaints, and, in addition, have saved a substantial amount of time and effort exchanging inoperative meters.



A SIGNIFICANT FEATURE is the provision for testing at reduced voltage to approximate abnormal operating conditions

Mystic Switching Station Design Keynotes Simplicity, Reliability—II

Boston Edison's latest generating plant combines local service with tie-line provisions—Unit principle employed—Switch aisles protected against moisture; circuit breakers against fire

WILLIAM W. EDSON, Boston Edison Co., Boston, Mass.*

THE AUTHOR PRESENTED (November 11, 1944, page 80) a discussion of the reasons back of the engineering design of Boston Edison's switch house facilities at the new Mystic steam plant in Everett, Mass., covering the general layout, bus and circuit arrangements. In these concluding pages a number of further details of this design are reviewed.

Bus and Cell Structure

The bus structure is of reinforced concrete. The reinforcing rods were covered with tape or short lengths of hose at various points to prevent closed magnetic circuits. Two-inch metal lath and plaster walls are placed between circuit breakers, reactors and each phase of cell wiring, disconnects, potheads and instrument transformers. All cell wiring and apparatus is protected by ebony asbestos cell doors. Insurance that only the three cell doors for any one circuit are simultaneously removed is provided by a definite tagging and checking procedure, but several aids have been incorporated. A triangular sign separates the circuits; the color of the signs alternates; the designation strips span one circuit and are of alternating colors; and a locking bar spans the three cell doors. To facilitate making the connections to the circuit breakers, a small runway was located in rear of the breakers.

14-KV. BUS aisle in Mystic switch house

Due to our past good service with the General Electric, Type H, oil circuit breakers it was decided to equip the two main bus sections with the Type FH-126-B, 23-kv. breaker. All are 1,500,000-kva. interrupting capacity except the breakers on the lines having reactors. These are FH-123, 23 kv., 500,000 kva.

Air Blast Experience Sought

In order to get comparative experience with air-blast circuit breakers, it was decided to fit the auxiliary bus of one section with Westinghouse, Type 150-CA, 1,500,000 and 500,000-kva. breakers and the other bus with General Electric AR-20's. As the two use different pressures, it was necessary to install two complete air systems each with duplicate compressors.

Potential transformers are connected phase-to-ground so that the principle of phase segregation can be carried out. The only point where the phases are brought together is at the generator terminals.

The potential transformers are protected with Schweitzer & Conrad combination resistor and disconnecting type fuses. Resistors are used to limit fault current below the setting of the bus differential relays, thereby permitting the fuse to blow. After we have had more experience with the current limiting fuse, these resistors may be omitted on future installations.

GENERAL ELECTRIC oil circuit breaker aisle

Isolating Aisles Provided

The four switch aisles open into cross-passageways at each end. The doors are made as light as possible and are free to swing open in case of sudden pressure caused by a short-circuit. Each aisle is equipped with electric heaters to prevent condensation. A ventilating system using filtered air is installed for summer use or as a smoke scavenger system in

*Head of Station Electrical Design Division, Engineering Dep't.

SECTION of Westinghouse air-blast circuit breaker aisle

case of fire. The aisles are also equipped with water fog nozzles, the supply pipes being connected to a manifold by removable sections of hose. There are drains in the floor and ramps at each end.

The oil circuit breaker aisles are equipped with a CO_2 fire protection system which is selected automatically by thermostats if the bus differential relays have operated. Over-temperature alone rings an annunciator.

Generator Equipment

The single generator bus is bent into "U" shape so that this structure follows the same general design as the four aisles of the feeder double bus. The cross-passageway provides segregation between the generator and feeder buses. To carry out the principle of having two escape openings for each aisle, it was necessary to add a balcony along the outside wall.

A second set of disconnects is installed in the tie between the generator and feeder buses to remove any live ends in one compartment if the tie is open.

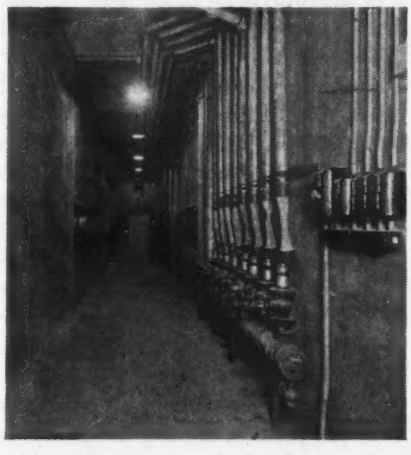
The generator leads are 3-2,000,000-cm. shielded Kerite cables per phase. It is interesting to see that the sizes recommended by the various cable manufacturers are much more in accord than they were a few years ago.

Since the 14-kv. lines are not normally connected in with any other generating station, it was necessary to ground the neutral of the station service transformer through a 4-ohm resistor similar to that of the generator so that the 14-kv. system will not be left ungrounded if the generator is out of service.

Operating Room Layout

The control switchboard on the third floor is laid out in the form of a "U", the operator's desk being at the center. The board is double throughout, the front panels being for the controls and instruments and the rear for relays. The 18 panels in the arc will provide for a total of 9 generators. One leg is for the 14-kv. circuits and the other for the 25-kv. and future 115-kv. lines.

Instruments and relays are surface-mounted to give more room on the rear of the panel for wiring. The relays are not of the drawn-out type, as we do not like the extra contacts. The ease in bench-testing a detachable relay does not mean much to us as we would require a further circuit test after the relay was replaced.



MANIFOLD and piping for fog fire-protection system

Slate was selected for the panels, as it is simpler to drill and wire in the field than steel. A vertical panel board was selected instead of a bench board as there is less crowding of apparatus, wiring and terminal boards.

To obtain segregation of control and secondary circuits, individual iron and fibre conduits were used throughout instead of troughs or terminal board compartments. These conduits are laid in five layers in a concrete fill on top of the construction floor. Each layer was very accurately located on the drawings and was installed accordingly.

The generator, transformers and lines have the usual complement of meters and relays. Following are some points that may be particularly interesting:

Switches are turn-pull type W with different shaped handles for various types of equipment being controlled.

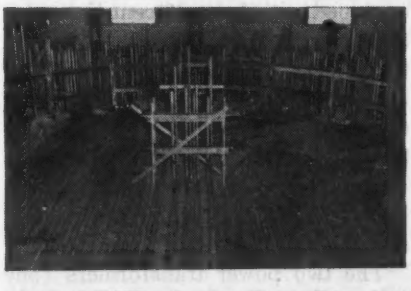
To insure that generator voltages do not drift during synchronizing, the neutral breaker must be closed before the field can be energized. The generator is equipped with a reverse power relay which operates a lamp to indicate motoring. Generator differential relays trip the main circuit breaker, neutral breaker, throttle and exciter breakers. A long time CO relay is in the generator neutral to operate an indicating light.

Differential Protection

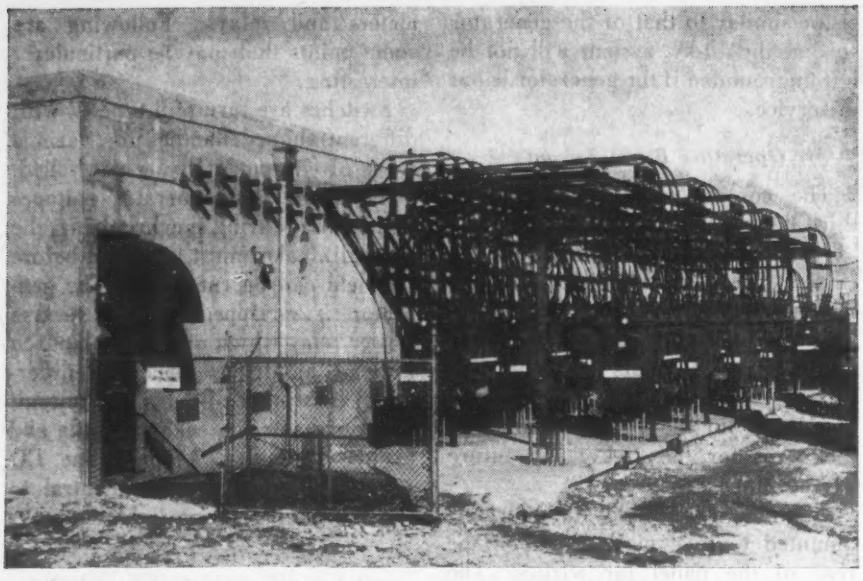
All buses are equipped with Type CA-6 differential relays. All of the current transformers involved are of the same ratio to prevent possible unbalancing. They are also specially designed to hold up their ratios during short circuits. As they are rated 3000/5, there should be no improper tripping for the present expected faults. In the future, if the currents materially increase, a more complicated and expensive system will be necessary. The tripping circuits from the auxiliary relay are connected through a multi-contact cut-off switch for use while testing.

The 14-kv. lines have overcurrent CO relay protection, the time setting being determined by the rest of the system. These relays also have instantaneous overcurrent elements to protect the reactors and cell wiring. At present the 500,000-kva. breakers on these lines can handle such faults but in the future it may be necessary to have these elements trip the bus differential relays.

We are unable to predict possible tripping of the transformer differential relays due to the magnetizing inrush current while energizing, so we purchased a Type AMI suppressor



ONE LAYER of control conduits as placed in the control room floor



ALLIS-CHALMERS 25-kv. outdoor circuit brakers at Mystic

relay to have it available where or when needed.

Ground detector relays are provided for the generator field and all control buses. An instantaneous overcurrent relay in the generator neutral and an under voltage relay on the bus trip the high speed drive of a duplex graphic ammeter and voltmeter to give a better chart during a fault. A separate d.c. switchboard is provided for the control battery, diverter pole charger, emergency d.c. lighting throwover, and the various d.c. control circuits. There is also an emergency tie to the control battery in the boiler station.

Power Transformers

A metal-clad switchboard contains the breakers for the two Westinghouse 300 kva., 575/120-208 volt air-cooled transformers, supply to the air compressors and the main feeders to the various power and lighting cabinets throughout the station.

The control room has filtered air ventilation, warm-air heating and fluorescent lighting. The units along the front and rear panels are also equipped with incandescent lights for d.c. emergency throwover. A special test room is provided on the first floor for a Lundin fault finder, Kenotron connections, phasing circuits, etc. A test bus run to the 14-kv. line cells. This bus can also be used for grounding and discharging the cables, and also as a transfer bus.

The two power transformers (one G.E. and one Westinghouse) are rated 25,000 kva. self-cooled and 33,333 kva. with blowers. They are 14-kv. delta to 25.6-kv. wye. Four 2½ percent taps are provided under this voltage. Both windings have oil-filled terminal pothead boxes with single conductor pothead for 2,000,000 cm. paper and lead cables on the 25-kv. side and 2-2,000,000-cm. rope core P&L cables per phase on the 14-kv. Until the second generator is installed, these two transformers are operated in parallel on one set of breakers. Temporarily, one set of 14-kv. cables goes to one bank and the other set to the other bank. The 25-kv. sides are paralleled by an extra set of potheads on top of the compartment of one bank with jumpers connecting the potheads inside. All transformers are mounted on concrete rails 2 ft. high to facilitate painting the bottom. Reinforced concrete barrier walls are placed between transformers for fire protection. Both power transformers are equipped with fog or spray nozzles, the water being turned on instantaneously and automatically by rate-of-rise thermostats.

25-Kv. Equipment at Mystic

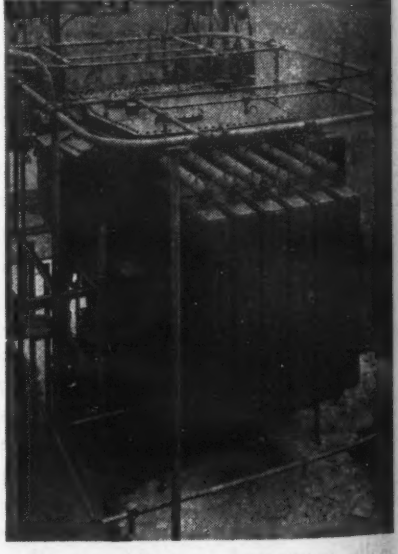
The design of the two 25-kv. bus sections has the same features of construction, segregation protection, etc. as the 14-kv. bus aisles. The oil circuit breakers, however, are located outdoors to minimize the effect of an oil fire or explosion. Also, at this voltage the installed cost is less than for indoor cell-mounted breakers. Indoor air-blast breakers were ruled out because of the lack of field experience with this voltage. The breakers selected are Allis-Chalmers, Type FZO-50-34F, 1,200-amp., 34.5-kv., 1,500,000-kva. equipped with bushing current transformers. The connections are Kerite cable mounted on insulators to reduce the exposure to dirt and birds. The buses have CA-6 differential relays. All lines have CR phase and ground directional relays. In addition, the three 25-kv. lines to L Street Station have CD balanced relay protection.

Initially the two lines to New England Power station at Revere are on one breaker. These two also have CD relays.

The two lines to Malden (N.E.P. Co.) are protected by Type HCB pilot wire relays. These lines also have in and out watthour and reactive kva-hour meters for billing purposes.

Each of the four 25-kv. lines is equipped with an Allis-Chalmers underload phase-angle and voltage regulating transformer, three rated at 10,000 kva. and the latest at 12,500 kva., plus or minus 10 percent voltage and plus or minus 25 per cent phase shift. These transformers are located on a concrete mat in line with the two power banks. A 25-kv. feed is provided to a Westinghouse 7,000/9,300-kva. common or emergency station service transformer for turbine and boiler auxiliaries.

At present it is expected that the third and fourth generating units at Mystic will be similar to the first two, with a duplicate switch house; but design changes can easily be made if needed.



WESTINGHOUSE 25,000/33,000-kva. transformer tying 14 and 25-kv. bus sections together. Automatic water spray piping is shown

Rectifiers Convert Newspaper Plant with Various Gains

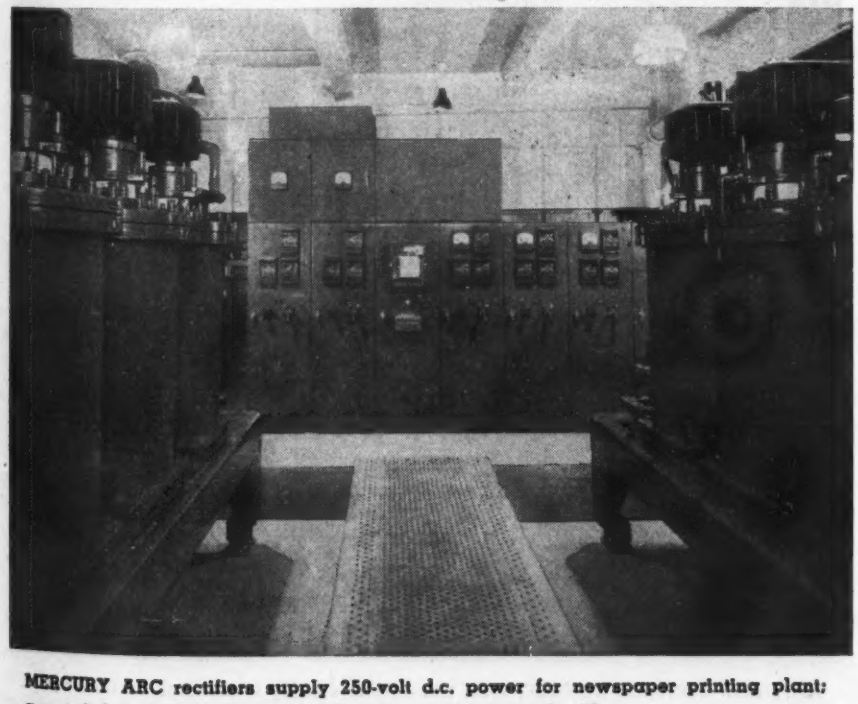
Rectifiers and central station connection replace turbine-generator units for d.c. supply to printing plant—Close voltage regulation advantageous for starting newspaper printing presses—Space and outlay gains established in 18-month operation

B. J. FOLEY, General Manager, Evening News Publishing Co., Newark, N. J.

CHANGE TO USE of purchased power through the installation of rectifier substation equipment for direct-current operation of presses and other equipment in the plant of the Evening News Publishing Co., Newark, N. J., has shown unusual economies among which are: Tripling print paper storage space in the building and reduced leased outside storage; savings in water costs as much as 80 percent per month; a saving in insurance premiums at the rate of about $300 per year; eliminating large quantities of lubricating oil for steam plant operation; and the use of waste heat of rectifiers for heating the building hot-water supply.

Tied in with the streamlining of the electric power section of the plant was the installation of two stoker-fired boilers for heating the building. Also, a 1,300-gal. tank was installed to store hot water discharged from the heat exchangers used with the rectifiers. This tank has three 5-kw. immersion type heaters controlled by thermostats to raise the water temperature to 170 deg. F. for use in showers and lavatories throughout the building.

Normal printing press operations require the use of one 250-hp. and two 200-hp., 240-volt d.c. motors. Filling in the valleys of the press loads are two stereotype pots each having 21 10-kw., 240-volt heaters with three-heat switches and thermostatic control. Lighting load is 88 kw. on 120/240-volt, 3-wire d.c. service. Average daytime (8 a. m.—8 p. m.) energy consumption is 144,000 kw.-hr. per month and for night time it is 80,400 kw.-hr., or a total of 224,400 kw.-hr. per month. Average monthly power demand is 732 kw. measured on the 4,160-volt incoming service.



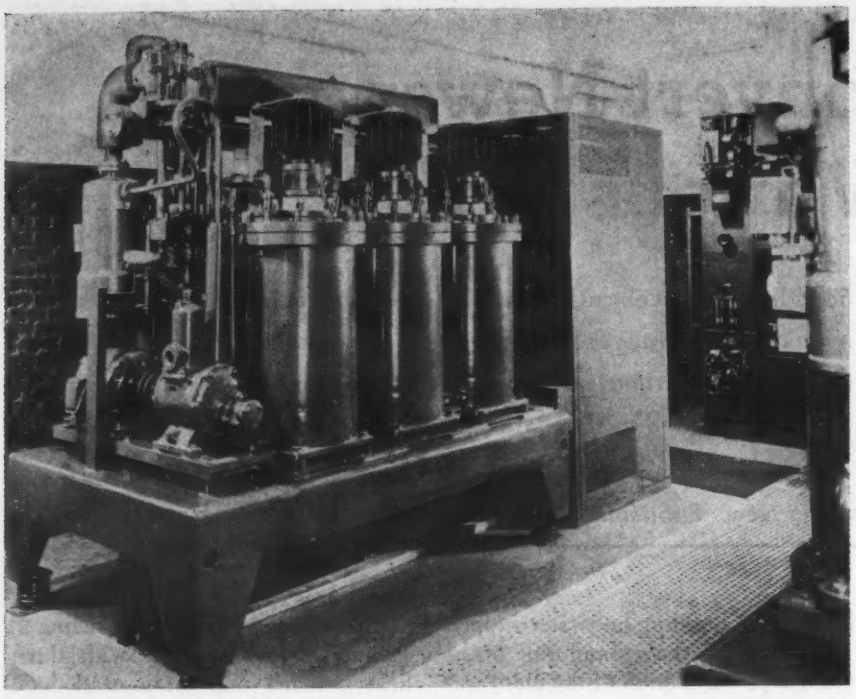
MERCURY ARC rectifiers supply 250-volt d.c. power for newspaper printing plant; a.c. switchgear in background. Rectifier tanks on each side

Prior Installation

Prior to May 30, 1943, when the rectifiers went into service, power was supplied by two 1,000-kw., 250-volt, 3-wire, d.c. turbine-generator sets; one set required to be in operation to carry loads frequently as low as 150 kw. for several hours. Steam at 240 psi. at the turbine throttle was furnished by two 495-hp. (normal rating) boilers. Steam at 5 psi. was bled from the turbine for the heating system in the building. Condensing water was cooled by two circular towers mounted on the roof (11th floor) of the building, each tower being 20 ft. diameter by 19 ft. high and its fan driven by a 40-hp. d.c. motor. These equipments, auxiliaries, piping and switchboards now are working in war production, as they were sold and installed in industrial plants in other locations.

Rectifier Installation

Both of the mercury arc rectifier units are the Excitron single-anode type manufactured by Allis-Chambers Mfg. Co. Each unit consists of the following:



ONE OF TWO six-tank 600-kw. 250-volt d.c. rectifiers used in this installation; control cabinet at end of frame; d.c. panels at rear

(1) A self-contained set of six metal-clad, water-cooled rectifier tanks designed for a continuous rating of 2,500 amp. (100 percent load) at 240 volts d.c. and capable of carrying 125 percent load for 2 hours and 200 percent load for one minute. A rotary type mercury vacuum pump with a ½-hp., 3-phase motor is included.

(2) A 3-phase/6-phase, Chlorextol-insulated, self-cooled main transformer having a 4,160-volt, 3-phase primary with four 2.5 percent taps and externally operated tap changer.

(3) Water-to-water heat exchanger with a 2-hp., 3-phase motor and thermostatic control.

(4) A d.c. balancer set, rated 40 kw., 125 volts, for 3-wire, 120/240-volt operation, with its control panel.

(5) Rectifier control cubicle.

Switching equipment for the incoming service and the rectifiers includes:

(1) Metal-clad a.c. switchgear for two incoming 4,160-volt circuits, metering, feeders for rectifiers and auxiliary power equipment.

(2) Two d.c. panels, each with 4,000-amp., solenoid-operated air circuit breakers and watthour meters.

Additional equipment includes:

(1) Three 25-kva. single-phase, 4,160/230-volt, 60-cycle transformers to furnish power for rectifier accessories and other purposes.

(2) One d.c. balancer set, rated 60 kw., 125 volts, for 3-wire, 120/240-volt operation, with control panel, used when either regular balancer set is out of service.

Simplified Operation

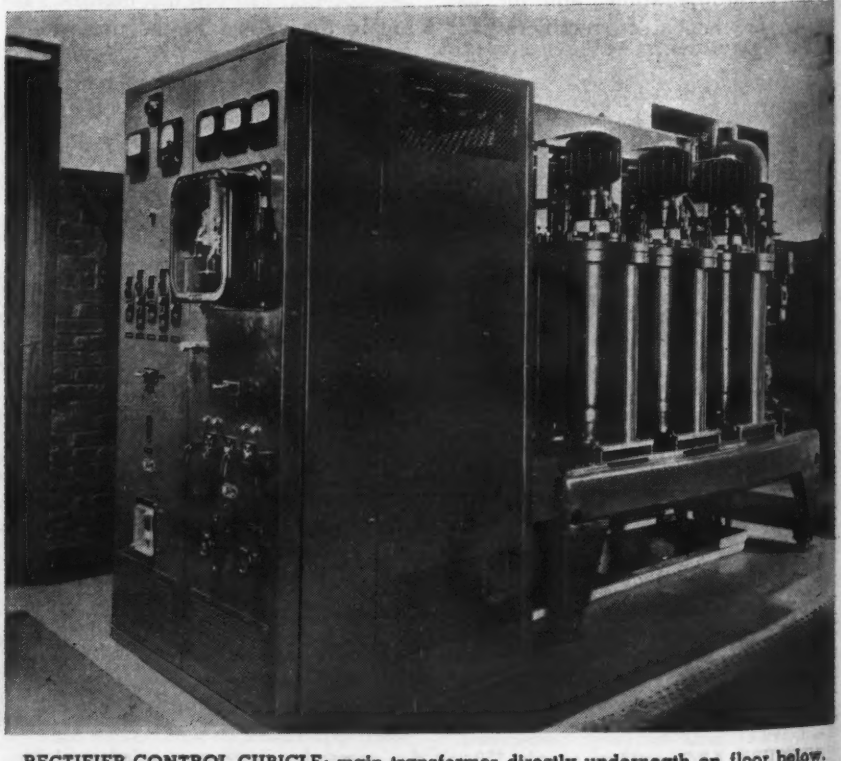
Among the outstanding improvements of the modernized plant is simplified operation. Only rotating equipments on each rectifier are a 2-hp. 3-phase motor driving a pump on the heat exchanger and a ½-hp., 3-phase motor on the mercury vapor vacuum pump. Practically full automatic control is provided for rectifier operation.

Automatic grid voltage control on each rectifier is provided to regulate the d.c. voltage so as to secure approximately constant 240 volts, independent of load conditions between one percent and 100 percent load and a.c. supply voltage variations not exceeding plus or minus 2.5 percent.

Both rectifiers are on the line when the presses are running. Each rectifier has a companion balancer set for 120/240-volt, 3-wire lighting and small power service. Each rectifier is interlocked with its balancer set for two reasons: (1) The balancer set must be on the line before the rectifier d.c. breaker can be closed, and (2) in case either the rectifier or balancer set shut down then both will be taken off the line.

Piping has been reduced considerably, runs can be traced more easily, and less valves are used and maintenance has been reduced, e.g., only 57 valves are installed whereas previously 735 valves in sizes from ⅜-in. to 16-in. were used on the boilers, condensers, turbines and gages.

Working conditions have been improved in the boiler and power rooms, e.g., temperature being reduced from



RECTIFIER CONTROL CUBICLE; main transformer directly underneath on floor below. Anode connections unusually short, about 12 ft.

120 deg. F. to a few degrees over outside temperatures in summer time.

Space Gains

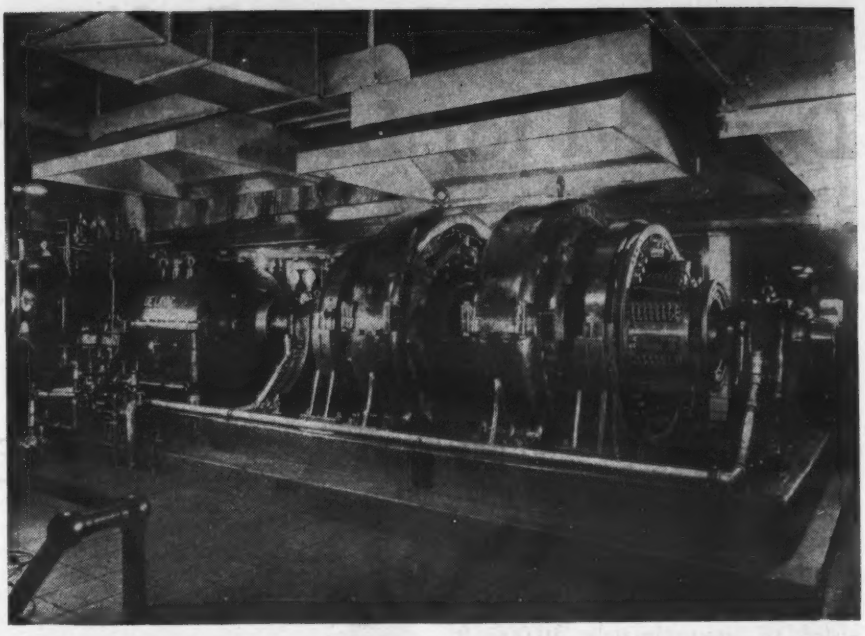
Gain in space was one of the economies effected by the changeover from isolated plant operation to use of central station power. In the space occupied by one of the former 495-hp. boilers a mezzanine was constructed on which was installed the rectifiers and cooling equipment, control cubicles, and a.c. metal-clad switchgear for incoming service and a.c. supply to the rectifiers and auxiliary transformers. At opposite end of the room the d.c. panels were mounted. Main transformers for both rectifiers were installed on the floor below and directly beneath the rectifier each supplies, thus making the anode connections unusually short, approximately 12 ft. Auxiliary transformers and heat exchangers for the rectifiers are also mounted on this floor. Water connections between the rectifiers and heat exchangers are made with Saran tubing, thus avoiding use of coiled rubber hose generally used for insulation purposes.

Space occupied by the other 495-hp. boiler was utilized for two new heating system boilers (Pacific Boiler Co.), each rated 150 hp., 15 psi., a 1,300-gal. hot-water tank and 500-gal. catch tank for the discharge water from the rectifier cooling system. The catch tank has an overflow to the sewer for excess water. A small induction motor-driven pump between the catch tank and 1,300-gal. tank maintains pressure on the building hot water system.

Space occupied by the turbine, generators, generator switchboards, condensers, and other auxiliaries was released for paper storage. Total space made available on the two floors immediately adjacent to the press room is approximately 4,000 sq. ft. This space, used for storage of print paper, triples the quantity stored in the building where it can be gradually raised to proper temperature and humidity for immediate use on the presses, and also reduces leased outside storage space.

Coal and Ash

Coal is now used only for heating and the amount has been reduced to approximately 500 tons per year. The monetary saving can be more fully understood when consideration is given to the increase in coal cost of $1.00 per ton. In addition, ash removal formerly required special scavenger service. A contributing factor to the coal reduction is the vacuum operation of the heating system most of the time, but in extremely cold weather the steam pressure does not exceed 3 lb. at the boilers.



TURBINE-GENERATOR unit rated 1,000 kw.; 125/250 volts d.c. and a similar unit, replaced by two mercury arc rectifiers

Water costs have been reduced 80 percent by the removal of the turbine condensers and water cooling towers on the roof, and by utilizing the hot water discharged at 115-120 deg. F. from the heat exchangers for the rectifiers. Additional heat for the hot-water supply is furnished in winter by circulating boiler water through the heat exchanger used for hot-water supply when the steam station was in operation. Use of the three 5-kw. immersion heaters in the hot-water storage tank permits complete shutdown of the heating boilers during the summer months.

Savings in insurance premiums of about 30 percent resulted from the installation of new boilers and their operation at low steam pressure.

Improved Press Operation

Another economy was the elimination of large quantities of lubricating oil for steam plant operation. For supply of power and heat the only rotating equipments in the plant are the balancer sets and small motor-driven pumps.

Constant voltage supplied by the rectifiers has improved the starting of the presses so that considerable time is saved in getting the presses up to speed. The operator can set his control for any desired paper output and will be assured that this will be maintained, whereas the former power supply required constant vigilance by the operator.

Since the rectifiers have been installed, occasional press shutdowns due to power failures have been eliminated. Electric service is provided by two 4-kv. circuits interlocked so that only one circuit can be used at a time. An alarm system operates in conjunction with an indicating instrument in the rectifier room and when actuated—by a.c. breaker open, d.c. breaker open, hot rectifier, loss of excitation, water failure, vacuum failure, or overheated transformer—sounds an audible signal in the building.

Modernization of the plant was designed and the equipment was installed under the supervision of the engineering department of the publishing company, with valuable aid given by engineers of the equipment manufacturers.

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A Four-Ounce Power Plant

The electric shaver's four-ounce motor has a thousandth of a horsepower, 103 major assembly parts and a coil with 23 feet of wire. It spins a shaft 6,000 times a minute.

Sleeveless Duct-Splice Devised for Lead-Sheath Cable

Split wrap of original lead with diagonal joint and staggered splices averts use of sleeve and makes union which withstands bending during reeling, handling and installation

J. B. BOWEN and J. G. BROWN†, San Diego Gas & Electric Co., San Diego, Calif.*

A RECENT PROJECT installed by the San Diego Gas & Electric Co. consisted of approximately 40,000 ft. of lead cable replacing pole lines adjacent to a military flying field. Due to war time restrictions on the purchase of new cable it was necessary to obtain what used cable was available in the surplus pool. This resulted in the acceptance of both varnished cambric and paper insulated cable. Most of this was in relatively short lengths and had to be unreeled and inspected for mechanical damage and sheath deterioration before acceptance.

In order to obtain proper cutting lengths without excess waste, approximately 60 duct splices were made on cable varying in size from No. 6–600-v., single-conductor to No. 4/0–12,000-v. 3-conductor.

Old Method Described

Prior to this job, duct splices had been made by sweating the conductors together, insulating and finally lead burning the sheath in the conventional method, that is, by two seams around the cable connected by a third longitudinal seam. The lead burning of these seams was done on the outside and in several incidents the sheath opened at the seams when the cable was bent during process of placing it on reels. Considerable difficulty had also been experienced in the past, when lead burning the seam, with cable grease leaking out and preventing a tight seam being formed at this point.

R. J. Rademacher, cable splicer for this company, in making these

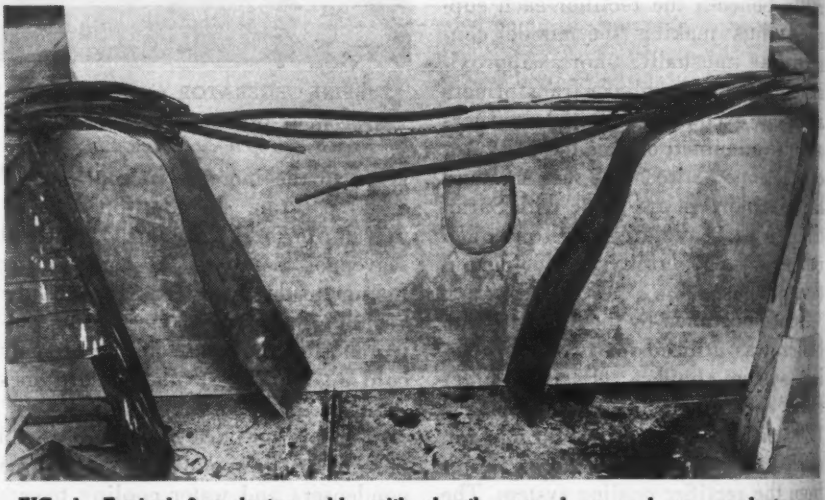
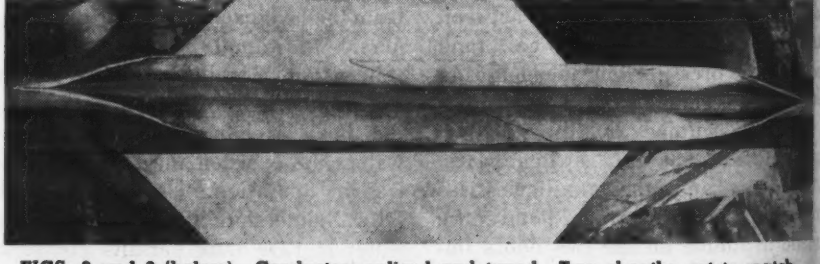
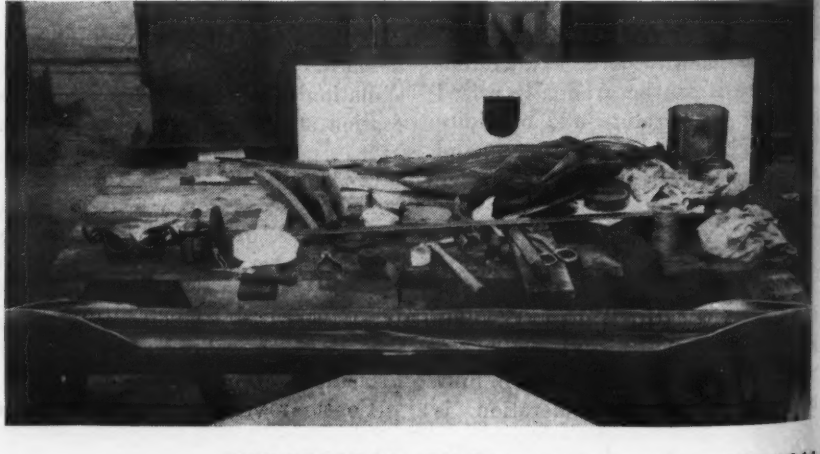


FIG. 1—Typical 3-conductor cable with sheath opened up and one conductor connected; other two splices will be offset



FIGS. 2 and 3 (below)—Conductors spliced and taped. Two sheaths cut to match



* Assistant Superintendent and † General Underground Foreman, Electric Repair Divisions.

duct splices developed a different method for joining the conductors as well as lead-burning the sheath which is the basis of this article.

In opening the sheath a single cut was made longitudinally on each piece of cable and the sheath opened out and a diagonal cut made on each sheath end as shown in Figs. 1 and 2 on opposite page.

Stranded conductors were spliced by cutting the strands alternately short and long on both pieces of cable. They were brought together fitting the long strands of one cable to the short ends of the other. The joint was then brazed; using phos-copper, thus obtaining a splice stronger than that afforded by the old method of sweating with solder. The joint was then insulated and taped.

Treatment of Sheath

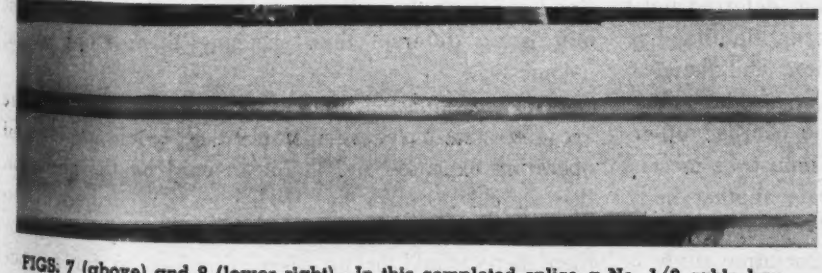
The two sheath ends were brought together and lead burned along the diagonal cut on the inner side, Figures 2 and 4. The sheath was then formed around the conductors and the longitudinal cut lead burned together as in Fig. 6. The diagonal cut was again lead burned on the outside thus reinforcing the diagonal joint.

This method of duct splicing has certain advantages over the older method in that there is only *one* transverse seam. This seam when closed is a helix tending to distribute the stress when the cable is subjected to reverse bending.

Lead burning the seam from the inside first eliminates the problem of cable grease running out as when burned from the outside as in the old method.

FIG. 4—Sheath joint has been lead-burned on the inside

FIG. 5—Sheath being closed preparatory to lead burning of seams (outside)



FIGS. 7 (above) and 8 (lower right)—In this completed splice a No. 1/0 cable has been spliced to a No. 2/0 by this method

FIG. 6—Lead burning of longitudinal seam after the forming of the sheath

Editorials

S. B. WILLIAMS, *Editor*

A Washington Information Bureau Needed Now

SEVERAL POLITICAL COMMENTATORS have interpreted the results of the presidential election as giving the Administration a mandate on foreign affairs but not on domestic issues. Any industry that puts its hope in such opinion is due for a sad awakening. As soon as the White House-approved bills and the budget are made public it will be evident that the Administration has taken the recent election as another vote of confidence on its management of home affairs.

Particularly should this be evident to the electric utility industry, for already the President has indicated his intention to press for speedy legislation on his vast waterpower program.

It might be that the Congress with its large Democratic majority will put the brakes on some New Deal plans, but it is hardly conceivable that there can be much disinclination to go along with the President without some good reason based on adequate and reliable information. There is no central bureau in Washington today that can supply that information insofar as it relates to the effect of new legislation on the electric utility business. The organization of such a bureau has been recommended many times, but always there has been some reason for delay. During all this period of procrastination valuable time has been lost. It may be too late if the industry delays much further.

Last spring when a Washington information center had the support of a large segment of the industry the more cautious, who were fearful of any move that might bring attention to the industry again in a national political fight, succeeded in having action deferred until after election. In the meantime, however, nothing has been done to effect such an organization, and the new overwhelmingly Democratic Congress is not far off.

Much of this delay will probably be charged up to the necessity for making a study of the industry's present association set-up before trying to create another body to be financed out of the same purse. There is much logic in that contention, except that if this association study is going to take any considerable time some practical way of starting an industry information center in Washington should be found now.

For nearly three years the industry has had an organization in Washington devoted solely to the war effort. There is little left of a war nature for it to do. It has, however, become established and pending a solution of the too-many-association problem might well be used to gather data and make them available to members of Congress and to the public. Of course, if this were done it would be necessary to announce the changed status of the organization but if it is done frankly little real harm will be done by the few stones that might be thrown.

Eventually the industry will have to combine all of its information and publicity efforts under one direction in order to get the most out of them. This includes information not only for the public but the employees as well. The pressing thing at the moment, however, is to start placing facts before members of Congress. It must not be permitted to wait until the industry is ready to do the complete job of consolidation.

Where Tax Discrimination Lies

AT THE RECENT CONVENTION of the National Association of Railroad and Utilities Commissioners the chairman of the Wisconsin commission said that it would be a desirable step "if publicly owned utilities were brought into the tax fold and required to bear their share of the cost of government the same as privately owned utilities."

More and more commissioners are becoming conscious of the need for correcting the tax discrimination that now exists in the field of utility service, but like the Wisconsin chairman they are pointing to the wrong problem. There is no reason for a government-owned property to bear any share of the cost of government unless there is discrimination against the public. In other words, in this particular instance it isn't that government projects should pay the same as privately owned properties but that the customers of the latter should not be discriminated against in favor of the former.

Normal government taxes are not paid by utilities—they are collected by utilities from their customers. That is why there should be tax equalization. The Knoxville customer, for instance, who buys TVA-generated energy, has no right to escape the payment of his share of the cost of government no matter how assessed. To excuse the users of electricity in any place from paying this tax simply because the collector happens to be a government unit is no different than excusing them from paying income tax.

The same situation should hold within a state. If there are any state taxes against utilities which are part of operating expenses and therefore paid by the customer, they should be borne by all customers regardless. However, if the state is entirely served by a state power agency then there would be no discrimination, so far as state taxes are concerned.

There is no reason why the customer of a government hydro system, a municipal plant or a co-op should pay one cent less tax than someone who is buying his energy from a profit utility. There can be no discrimination on this point between public and private operators—only between the customers. That is the point that must be hammered home.

Are Utilities Interested In the Transit Load?

WHY ARE NOT the power companies taking a greater interest in the trolley coach as a load builder? That question was posed to us recently along with the information that there are some thirty cities that have plans to purchase approximately 2,500 additional trolley coaches with an annual energy consumption of 400,000,000 kw.-hr. Last year the trolley coach consumption in the entire country was just over 400 million kw.-hr.

In looking over national statistics one is struck by the rapid decline of the transit power load. In 1930 6⅔ percent of all energy sales were made to street and interurban electric railways. Ten years later but 3.4 percent, and last year just over 1 percent. Likewise in revenue from energy sales to this class of load. Twenty-five years ago it was nearly 7½ percent of the total. By 1930 it had dropped to 2½ percent and but a little over 1 percent last year.

Here is a load, which was once a major load, that is fast slipping away. Except for the war years, when all forms of transportation picked up, the transit load showed a continuous falling off due to more modern forms of transportation. Some fifteen years ago the trolley coach made its appearance and has shown a consistent growth ever since. Reports on post-war plans indicate an even greater rate of growth.

Is the transit load one which the utilities wish to keep, or are they satisfied to let it go to gasoline? Other loads which in themselves do not loom up nearly as large as the trolley coach receive utility promotion. Is there something inherently wrong with this load?

It has been said that the rates to attract the load are too low. The rate situation for the entire transit load shows a marked downward trend. In 1920 a transit kilowatt-hour averaged 11.2 mills. In 1934 it went under one cent and last year averaged 8.6 mills.

The peak year in revenue from this class of business was in 1936 when it passed $68 millions. The low point was half of this in 1941. War-time transportation brought the figure up to $41 millions last year but this is expected to fall back when gasoline rationing is over.

Generally speaking, once a city has converted to gasoline transportation it does not go back to electric means, although there have recently been two notable exceptions. in Dallas and Oklahoma City. Therefore, if a power company has any interest in the preservation of this load it would be prudent to act before the gas vehicles take over.

So far the trolley coaches have been sold to the transportation companies without much, if any, assistance from the power companies. If the trolley coach load has been able to grow to sizable proportions in a decade and a half without their sales help, it can grow much faster in the future with their active support.

Will the utilities give that support? Before that can be answered it would seem as though they ought to have some good idea of the behavior of this load, some indications of the investment required, and a clearer picture of the stability of the market. When this information is available it might be possible to recapture the power company interest in this market, for the power companies are not going to be cold to any load that over a period of years, can be profitable on their systems.

Commissioners Again Refuse Depreciation Recommendations

FOR SEVERAL YEARS the report of the Committee on Depreciation has been a storm center at the annual meetings of the National Association of Railroad and Utilities Commissioners. The conservatives, however, won out again this year and refused to recommend the principle of straight-line depreciation as suggested in the report. The convention was unwilling to go beyond distributing the report for consideration, although the chairman of the committee said that "no single rigid formula (of depreciation) is advocated for none could be fairly applied . . . under all the various combinations of circumstances which might obtain."

There are many commissioners who favor the straight-line theory but there are also many who are very much gun shy of suggestions that have anything even remotely suggesting regimentation. They realize that the subject is still moot and they are unwilling to accept it as standard until there is more complete agreement.

Moreover, the statement of "no single formula" has a familiar ring. The Supreme Court used it to soften the death blow to fair value, but, as everybody expected, a single formula has resulted—a formula designed by regulation that gives little longitude, if any, to the utilities—a formula supposedly for the purpose of reducing the time and cost of rate cases but operating as a matter of fact to reduce rate base.

Unfortunately too little reliance can be placed on principles except they be well defined by formula. Equity can prevail when both sides have a hand in writing and administering that formula.

The committee worked diligently for a long time and it is regrettable that the presentation of its report had to be marred by the chairman's remarks about critics. Obviously, it was his right and duty to disagree with criticisms which he did not think proper or well founded. It was the slurring manner of his disagreement that was uncalled for. Remarks like that help to maintain a barrier of fear and distrust between utilities and regulation.

WASHINGTON COMMENT

By R. N. LARKIN, Washington Correspondent

No Change Expected in New Deal Power Policy

WASHINGTON HAS BEEN rife since the election with speculation on the attitude toward domestic questions which may be expected from Mr. Roosevelt.

Most of the speculation arrives at one of two conclusions—either that the President will retain his present position as somewhat to the right of center on domestic affairs, or that, having won re-election for what is widely believed to be his final term, he will veer left again, perhaps with a vengeance.

Right or Left

Those who believe that he will continue on the right, point out that most of the top civilian war-administrative jobs have gone to men from the business and industrial communities which in general have resisted the New Deal. The President, say those who support this view, is impressed with the tremendous war job done by private capital and management, and is convinced that the real hope for a prosperous nation in post-war years lies largely in the hands of this group, and not in huge federal expenditures. (They concede that federal expenditures will be used if private enterprise fails.) They say the President has his eye on his place in history, and that he will be reluctant to embark on extreme "New Deal" programs which might detract therefrom. Finally, they argue, the President this term is almost certainly not faced with the prospect of buttering up the diverse minority groups whose support would be necessary to re-election to a fifth term. These observers hold that the President won a fourth term too handily to be irrevocably indebted to the CIO's Political Action Committee, whence the strongest urgings for a pronounced swing to the left will emanate.

The opposing school of thought points to 1933, when, after campaigning on economy in government, Roosevelt thoroughly exploited the field of deficit financing, to 1936, when the talked of "breathing spell" disappeared in the sound and fury of the Supreme Court fight, to 1940, when a campaign based substantially on preparedness for peace and defense was followed by the request for passage of the Lend-Lease Act. The President, these people argue, didn't win his niche in American history by siding, in his economic program, with capital, management and business, and there is no reason to believe that he will attempt to preserve or augment his place in history by a late session of hand-holding with the groups which only a few years ago comprised his most outstanding domestic antagonists.

More of the Same on Power

However orthodox or extreme the President's domestic policies may be for the next four years, there will only be more of the same as regards the electric power business, nor can this conclusion be termed speculation.

Some weeks ago, for instance, the President called upon Congress to enact legislation establishing a Missouri Valley Authority to develop the Missouri along much the same lines as the Tennessee Valley Authority developed the Tennessee. This was hardly classifiable as "campaign oratory" any more than last week's call for the division of the country into seven major watershed areas for development along the lines of TVA was campaign oratory for 1948. This, whether the electric power industry likes it or not, is basic Roosevelt, no more to be wondered at than the annual appropriation for the upkeep of the White House. It may or may not become law, depending on a number of variables, but as far as the Administration is concerned, this policy and others resulting from this type of thinking are standard fare for the power business and will be for another four years at least.

The St. Lawrence Seaway, with its accompanying power project, drew from the President a few days ago a comment which indicated that the administration is determined to fight this undertaking through to acceptance and authorization during the fourth term. The President said he cared not whether it was brought up before the end of the 78th Congress next month or whether it had to await the incoming 79th Congress, adding that it made no difference to him whether it was authorized as a treaty with Canada or as legislation under the joint executive agreement of 1941 —so long as action on the matter was had.

In addition to these two proposals, which certainly indicate nothing if not "New Dealing as usual" for the power business in the post-war period, there is the President's message of last September, urging broad extension of the rural electrication program. There is also the President's desire, expressed late last year, that federally owned generating plants installed for war purposes be incorporated wherever possible after the war with existing public systems. The steadfastness with which the Administration has successfully resisted throughout the war any attempts to freeze the activities of the Securities and Exchange Commission under the Holding Company Act, thereby releasing skilled engineers and accountants for other war endeavor, means nothing if not that SEC's program will proceed under a full head of steam.

Coalition Possibilities

Nominal administration control in Congress will be stronger, than it has been for the last two years although there still remains ample opportunity for more of the Southern Democrat-Republican coalition.

That such a coalition will be widely effective against whatever power program the Administration really is willing to fight for in the next two years is doubtful. Party lines essentially dissolve when REA and river development legislation is brought up.

NEWS OF THE WEEK

'Straight-Line' Depreciation Starts N.A.R.U.C. Dispute

Delegates at Omaha Conference of Utilities Commissioners Vote Only to Distribute Nelson Smith Report on Depreciation—Post-War Conditions May Make Higher Utility Rates Necessary, McKeown Says

Refusal of delegates to accept a resolution "recommending" the principle of "straight-line depreciation" for utilities injected a controversial note in proceedings of the 1944 War Conference of the National Association of Railroad and Utilities Commissioners last week at Omaha.

The struggle over the report of the committee on depreciation took nearly a day of the four-day meeting. Other portions of the program of interest to electric utilities included the report of the committee on rates of public utilities calling for closer cooperation between utilities and regulatory bodies, a report of post-war problems and their solution, and a speech by Basil Manly, chairman of the Federal Power Commission, describing the commission's work in "squeezing a half a billion dollars worth of water out of the stocks of the country's utilities."

The controversial report of the committee on depreciation was prepared under the chairmanship of Nelson Lee Smith of the Federal Power Commission. It carried the twelve conclusions reached in the 1943 report along with supplementary material. Some of these views on depreciation were in brief that depreciation is essentially an economic problem; that it should be estimated realistically on an age-life basis, that depreciation accounting rather than retirement reserve accounting should be followed, and that while the usefulness of the sinking fund method in certain accounting and rate situations is recognized, under ordinary circumstances the straight-line method is generally preferred for accounting, financial, and regulatory purposes.

Defeated 11 to 9 by the executive committee, the Smith resolution along with one submitted for the executive committee by George C. McConnaughey, chairman of the Ohio Public Service Commission, urging that the report be "distributed for consideration and application," was placed on the floor. The substitute measure passed despite statements of Smith that it would in effect repudiate the report of the committee.

Chairman Smith said the committee had worked seven years in making the depreciation study and that it was in line with policies of FPC and other federal regulatory commissions of many of the state commissions and that it was favored by many in the utilities industry.

Wade O. Martin, Louisiana Public Service Commissioner and retiring president of the association, was one of those who opposed the Smith resolution.

The report of the committee on rates of public utilities, submitted by Francis M. McKeown, Massachusetts, pointed out that the determination of the so-called "rate base" involves much research and litigation and has been overemphasized. "There is too great an effort to standardize and a tendency to reduce these sums (rates) to such an extent that people who have honestly invested their funds in an enterprise are being made to suffer unduly by the acts of some of their agents performed in good faith."

The possibility that utilities may have to seek higher rates in post-war years because of shifts in loads was also indicated.

"It is regrettable," the report said, "that the federal tax structure has not allowed proper post-war reserves. The excess profits tax, to our mind, has not been equitably assessed on our utilities. Utilities with high earnings in the period prior to the war in many cases pay little or no excess profits taxes, while on the other hand a utility with a rate of earnings well below is paying heavy excess profits taxes.

"It is possible that we will be faced with petitions for rate increases as a direct result of many of the utilities having the surplus earnings syphoned off by heavy taxes, notwithstanding normal dividend payments."

An aggressive sales policy and an enlightened rate program were called the keystones to rapid recovery in the post-war era by R. W. Peterson, chairman, Public Service Commission of Wisconsin, in his talk on "Utility Problems in the Transition to a Peace Economy and the Proper Solution Thereof."

Low Rate Program Important

He declared that the probable existence of a large surplus of generating units which can be adapted to utility and industrial service will provide keen competition in the form of alternative sources of supply which utilities can meet only with a rate program enabling them to undersell their competitors.

The utilities must aid their customers to reconvert to a peacetime economy and then must revitalize their sales promotion to take advantage of the market that will be available.

The life of a utility as a private enterprise, he warned, is likely to be short unless it has public good will. He urged that the public be kept informed of the great bargain they are getting when they buy electricity and added that voluntary reductions in rates be made whenever possible as utilities lose good will when rate reductions are brought about by consumer demand or commission order.

Mr. Peterson advocated that publicly owned utilities be taxed the same as

privately owned companies.

Florence M. Kiely, a member of the Michigan State Public Service Commission, read a statement prepared by its chairman, G. T. Shilson, saying a Michigan Supreme Court decision ordering the Detroit Edison Co. to rebate $10,450,000 to its customers had been wrongly interpreted as ordering the reduction of rates by public utilities liable for federal excess profits taxes. The commission has taken the stand that the court ruling was only a directive to search for unnecessary expenses, taxes, or otherwise.

George C. McConnaughey, Ohio, was elected president and John D. Biggs, chairman of the Illinois Commerce Commission, first vice-president and Duane Swanson, chairman of Nebraska Public Service Commission, second vice-president.

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Milwaukee Appeals Ruling on Modified "10 for 1" Plan

A rehearing of the rate case in which the Wisconsin Public Service Commission approved the application of the Wisconsin Electric Power Co. to modify its "10 for 1" plan (ELECTRICAL WORLD, November 4, page 8), has been asked by Joseph L. Bednarek, assistant city attorney for Milwaukee, in a petition filed with the commission.

In his petition filed in behalf of the city, Attorney Bednarek held that the new order discriminates against old users who do not use twice as much electricity as they consumed in a corresponding month the year before in any period of six consecutive months; that it discriminates against new users; that the proposed increase in the minimum rate under the "10 for 1" plan from 1 to 2 cents a kw.-hr., the increase to be added at the rate of ¼ cent a kw.-hr. at three month intervals, is unlawful in that it was made without a showing by the company that any such increase was warranted; and that there is no reason why the plan should be modified now after operating nine years.

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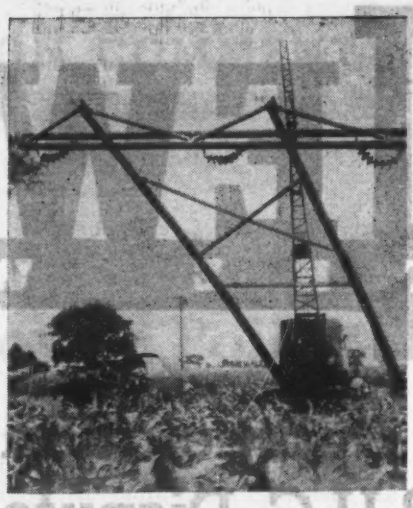
Quebec Power Co. Buys Ste. Catherine System

Quebec Power Co. has been authorized by the Quebec Public Service Board to buy the distribution system of the Ste. Catherine Electricity Corp., Ltd., for $65,000, effective as of June 1, 1944. The Ste. Catherine corporation serves Ste. Catherine, Lac St. Joseph and St. Augustin and has 43 miles of electric lines.



LINE NEARS COMPLETION—Newest 132-kv. transmission line of Wisconsin Electric Power Company between Port Washington station and Granville substation, shown above under construction, is expected to be placed in temporary operation shortly. Permanent operation will begin after January 1 upon delivery of carrier current relaying equipment. The line, 23-miles long, uses 477,000 cir. mil ACSR conductor for 13.4 miles of its length, 300,000 cir. mil stranded copper for the balance. H-frame structures, being lifted by truck crane, consist of two 65-ft. class two poles.

Oregon Dehydrating Plant Uses Electric Equipment

The Wright dehydrating plant, McMinville, Ore., has completed installation of electrical heating equipment with a capacity of 400 kw. Consumption will run from 1,500,000 to 2,000,000 kw.-hr. annually. The load, according to Milton H. McGuire of the McMinville Light Department, is particularly desirable because operations are continuous over a 24-hour period.

The installation is among the first of its kind in the United States, and engineers are checking the operation results to compile data for comparison with the steam heating system used previously. The new installation is a combination of the two methods.

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Florida Power Corp. Gets Lake Wales Franchise

Florida Power Corp. has been granted a 30-year franchise to operate in Lake Wales. The franchise includes a ten-year recapture clause whereby the city may purchase the company's property, and also grants a reduction in rates for power used by the city.

Union Electric Co. to Spend $100,000,000

A construction program calling for expenditure of nearly $100,000,000 by the Union Electric Co. of Missouri during the ten-year period following the end of the war was announced November 8 by J. Wesley McAfee, president of the company.

First step contemplated is enlargement of Venice power plant to add 120,000 hp. to the 200,000-hp. generating capacity, it was stated. This will make necessary a proportionate increase in transmission facilities.

Dust collectors are to be installed at Cahokia Station where one stack had already been equipped for smoke elimination when restrictions on materials halted the work. Five remaining stacks will be similarly equipped when resumption of this type of construction is permitted said Mr. McAfee.

Additional boiler installations and general improvements will be made at the Ashley Plant. Toward the end of the ten-year period, replacements will be made at Cahokia possibly involving additional capacity. Some improvements are contemplated in the vicinity of Keokuk Dam.

Tentative plans call for spending about $45,000,000 for new facilities and the replacement of old equipment between 1945 and 1950 with additional work in extending power lines and improving facilities bringing the total investment to nearly $100,000,000 by the end of ten years.

"This program will not only reemploy our own men and women now in the armed services but will provide hundreds of additional jobs," Mr. McAfee declared.

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Wisconsin High Court Voids Closed Shop Pact

The Wisconsin Supreme Court recently upheld the state labor relations board's demand that a closed shop agreement at the Northern States Power Co. in Eau Claire be voided. The case came on an appeal from the Dane County Circuit Court.

No reason for upholding a board order requesting the utility to "cease and desist" from making union membership a condition of employment was given.

The power company and the American Federation of Labor electrical union made the closed shop pact in 1941. In 1942, after four non-union members had been discharged, the labor board intervened and ordered the men reinstated with back pay.

Aiken Move Would Speed St. Lawrence Power Fight

Vermont Republican Says That He Will Offer An Amendment authorizing Project to Rivers and Harbors Bill in Senate and to Flood Control Bill if Necessary to Get Vote—Approval by Legislation Opposed

A show-down on the St. Lawrence seaway and power project may develop this week or next as a result of the announcement by Senator George D. Aiken, Vermont Republican, that he will offer an amendment authorizing the project when the Rivers and Harbors bill comes before the Senate.

It was indicated that if it becomes necessary, in order to get a vote on the project, the amendment will be offered to the Flood Control bill.

Aiken's move was directly in conflict with the action of the Senate Commerce subcommittee which has jurisdiction over the St. Lawrence project, and which has successfully staved off Aiken's earlier attempts to get action on it. The committee agreed last week to begin hearings this week on whether Aiken's amendment should be handled as legislation, requiring a simple majority of both Houses, or whether it should be handled as a treaty, requiring a two-thirds vote of the Senate for approval. Aiken's amendment would approve the executive agreement on the St. Lawrence negotiated by the United States and Canada in 1941. If the committee determined that the project required a treaty, the amendment would be referred to the Foreign Relations Committee, where it could be pigeonholed for months under the pressure of other international agreements which are in the making. Both the President and State Secretary Cordell Hull have voiced the opinion that the agreement can legally be adopted as legislation rather than as a treaty.

May Defeat Aiken Amendment

Senate Majority Leader Alben W. Barkley said the Aiken amendment will be in order on either the Flood Control or Rivers and Harbors bill. Thus, if the Vermont Senator were successful in getting the project added to either bill, he will have succeeded in by-passing the subcommittee's hearings. It is by no means certain that the Senate will adopt the Aiken amendment, or that, if it did the House, which last spring left the St. Lawrence project out of the Rivers and Harbors bill as too controversial, would accept it.

Senator James M. Mead, New York Democrat and nominally a strong administration supporter, said last week that adoption of the Aiken amendment by legislative rather than treaty process would set a dangerous precedent in view of the other international agreements which impend. He said the St. Lawrence project has vast military and economic implications for both countries and declared that each nation should know its duties and its rights under the project completely. He denied that the commerce subcommittee, of which he is a member, is attempting obstructionism against the St. Lawrence project. It was apparent that some support for handling the matter as a treaty will be forthcoming from Senators who fear that the Administration might try to bypass the Senate in other international agreements, notably any regarding world security organizations.

Mead, who normally could be expected to support the Administration, may hold the key to the subcommittee's action on the Aiken amendment. Chairman John Overton, Louisiana Democrat, and Sen. George L. Radcliffe, Maryland Democrat, are opposed to the St. Lawrence seaway, while Sens. Arthur H. Vandenberg, Michigan, and Harold H. Burton, Ohio, both Republicans, favor it. Mead, who would normally vote for it as an Administration man, is also a native of Buffalo, where sentiment against the seaway is strong. He is known to have some ideas about running for mayor of Buffalo.

Testimony minimizing the effect which construction of the huge St. Lawrence power project would have upon privately-owned electric companies of the region was presented by Norman R. Gibson, vice-president and chief engineer of the Buffalo Niagara Electric Corp. at hearings held before the Securities and Exchange Commission recently in regard to a plan for reorganization of BNE's parent company, the Buffalo, Niagara & Eastern Power Corp. Gibson declared that existing New York state laws provide for sale of this type of power to existing distribution outlets. Under the Aiken amendment, the power part of the St. Lawrence project would be sold to the Power Authority of the State of New York for about $94,000,000, with the energy to be marketed by the state authority on a wholesale basis.

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Union Electric Co. Installs FM on 54 Trouble Cars

Union Electric Co.'s fleet of 54 trouble cars in the St. Louis area are currently being equipped with two-way FM radio equipment, following recent official authorization from the Federal Communications Commission, according to W. R. McMillan, system superintendent of distribution service. The entire group of emergency vehicles will be covered by a central transmitter now being installed. Cars are being equipped with 30-watt transmitters embodying the latest type of short wave frequency modulation.

ANALYZE POST-WAR LOAD PROSPECTS—Electrical men who assembled recently in Connecticut to study post-war load building possibilities, left to right, William Walsh, merchandise manager, Connecticut Light & Power Co.; Robert Oliver, assistant manager, lamp division, General Electric Co.; J. E. King, operating vice-president, C. L. & P.; R. H. Knowlton, executive vice-president, C. L. & P.; Harold Green, sales promotion department, General Electric; and A. V. S. Lindsley, vice-president in charge of sales, C. L. & P.

Electronics Ramified on Power Systems

Pennsylvania Electric Assn. Communications Committee Finds over a Hundred Applications

Rapid rise in importance of electronic apparatus on power systems was recorded in the discussions of the Pennsylvania Electric Association's Communications Committee at Pittsburgh, November 16 and 17. Part of the program was aimed at facilitation of further orderly and judicious applications and improvement of carrier equipment to parity with the power equipment of the systems.

H. S. Fitch, of the P.E.A. executive committee, in a luncheon talk urged alertness to the technological changes which are paralleling the current economic and social re-structuring. He cited electronic progress and the resurgence of d.c. as typical of things which a smart business would keep in perspective for sound and conservative adaptation.

Conference Will Be Held

Detailed discussion of the communications committee's analysis of the state of the art of carrier current technique led to the decision in favor of a conference with manufacturers on design details with the objective of rendering carrier even more broadly applicable to evolving needs of power systems through the medium of the ensuing formal report. This was in line with previous approval by the association's electrical equipment committee.

A roundup by H. N. Ekvall, Philadelphia Electric Co. showed no less than 101 diverse uses of electronic equipment on 7 of the member company systems. These uses fall in nine categories with measurement accounting for one-fourth, and rectification, alarms and indicators, testing and fault location next in order. Half the applications were found to be no more than 5 years old and only one-fifth are as much as 10 years old. Kenotrons date back 25 years, carrier telephone 20 years and carrier relaying only 6 years.

Technique of calibrating frequency meters was reported by S. K. Waldorf, Safe Harbor Water Power Corp. He listed the desirable characteristics of the a.c. source, reference standard and comparator to meet the one-hundredth cycle accuracy desired by system operators. He favored the oscilloscope over the stroboscope comparisons. W. R. Hamilton, West Penn Power Co., said a drift of 0.1 cycle meant usually a one percent shift in interchange. G. P. Fallon demonstrated an electronic assembly under trial at Baltimore for testing frequency meters. Tuning fork frequencies of 239.2, 240 and 240.8 are divided by four to produce 59.8, 60 and 60.2. C. Nichols outlined the Leeds & Northrup factory procedures in calibrating the frequency recorders, in particular mentioning a resonator which minimizes the harmonics in the bridge circuit.

Adoption by several railroads, notably on the Pennsylvania's Harrisburg-Altoona division, of 88 and 120-kc. carrier for end-to-end and train-to-yard communication was described by L. O. Grondahl, director of research and engineering, Union Switch & Signal Co. Propagation is largely by inductive coupling to the rails and to the adjacent wires.

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Kentucky Edison Seeks Interconnection with K. U.

Because the Kentucky Edison Co. is dependent upon a single gas-powered generator which may have to be abandoned, the company has applied to the Kentucky Public Service Commission for authority to extend its lines from Frenchburg to Salt Lick to make connections with lines of the Kentucky Utilities Co.

Fleming-Mason Rural Electric Cooperative has intervened, pleading that it has already started construction of a substation connecting with K.U. lines at Olympia Springs which could be made available to Kentucky Edison for emergencies.

HONORED VETERAN—Harry Kingsley (right), superintendent of distribution, Salem (Mass.) Electric Lighting Co., receives a diamond studded pin from President Frank L. Ball in recognition of 55 years of service, an usually long period of activity on the New England Power System and its predecessor Tenney group of properties. The pin called for special designing as it is the second of its kind to be conferred on a System employee. A silver platter was also given Mr. Kingsley on this occasion

Boys Shoot 87 Insulators but 33-Kv. Line Stays In

When a line patrol of the Central New York Power Corp. found 87 insulators on a live 33-kv. line damaged or broken on a recent tour of inspection, they started an investigation which led to the arrest of four boys by the New York State Police.

The line which ran from the Teall Avenue substation north of Syracuse, east and south around the city, to the Solvay substation, serving war plants, a medical center, railroads, and domestic users, continued to function without interruption. The dry weather of the area at the time of this escapade was a favorable factor.

The damaged insulators were on the line where it passed through a wooded and hilly section of the country. The boys confessed that they had used the insulators for targets for the .30-.30 rifle which one of the boys had sneaked from his home. Because they were under 16, the company refused to prosecute; but the boys were fined a small sum by a justice of the peace.

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Chicago Votes Approval of Street Lighting Bonds

Chicago voters in the recent election overwhelmingly approved the city's proposed $3,000,000 bond issue to finance the extension and improvement of the electric street lighting system in the city (ELECTRICAL WORLD, November 4, page 7). The proposal carried by a margin of over 600,000 votes or a ratio of about 3 to 1.

Of the $3,000,000 allocated to the improvement program $2,000,000 is to be spent for the installation of lighting on streets not now lighted; $500,000 for the replacement of gas and gasoline street lamps in certain areas; $250,000 for the replacement of other street lighting facilities now considered unsafe.

Bulk of the work under the program will be delayed until the removal of restrictions on materials and equipment by WPB, C. S. Shaffer, superintendent of the Bureau of Electricity stated.

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British Columbia Lifts Ban

Restrictions placed last May on the use of power on the lower British Columbia mainland have been lifted because of the improvement in the water supply following recent rains.

War Production Lag Curbs Reconversion

OWU Alarmed at Shortages of Essential Materials Holds Up Announcing of V-E Day Plans

The administrative letter in which the Office of War Utilities had planned to disclose to the electric utility industry the post V-E Day version of order U-1 may be held up until the defeat of Germany.

OWU for some weeks has been planning to explain in considerable detail its post V-E Day plans, as well as to unveil the abbreviated U-1 which will govern utility operations thereafter. The administrative letter has been held up awaiting publication of WPB's detailed V-E Day plans. It now appears that WPB's plans will not be made public, apparently at the request of high war officials who are becoming increasingly worried at the lag in critical war production. It is felt that publication of detailed reconversion plans at this time would further the let down under which war workers have been leaving jobs, and recruiting for critical programs has failed to meet the needs.

Decision Expected This Week

Decision on the hold-up was expected this week after the return of WPB Chairman J. A. Krug, who spent last week visiting lagging plants in the Midwest.

Indicating the seriousness of the lag in a few critical programs—heavy bombers, heavy artillery and its ammunition, heavy trucks and tires, assault transports and cargo ships, cotton duck and radar equipment—War Mobilization Director James F. Byrnes last week threatened to halt the limited reconversion to civilian output, including WPB's "spot authorization" program, if the bottleneck is not broken.

The bottleneck, Byrnes disclosed, is 200,000 able-bodied men for the critical programs. Failure to meet the programs, Byrnes said, is due to "the mistaken belief on the part of some people that the war is about over."

Under the spot authorization program which is in danger of being halted, WPB allows the manufacture of civilian goods by manufacturers who can show that they can operate without using manpower or materials needed in the war program. As of the end of October, electrical equipment valued at $8,930,000 has been approved for production under the program, starting in the present quarter and running through the fourth quarter of 1945.

Electrical products approved under the program, and their value are as follows:

Electrical conduit and fittings, 1 application, value, $53,000; domestic vacuum cleaners, 7 applications, value, $4,954,000; bulbs and tubes, 1 application, $20,000; portable incandescent lamps, 36 applications, $1,241,000; domestic cooking or heating appliances, 29 applications, $1,395,000; electrical appliances, not cooking or heating, 6 applications, $72,000; domestic electrical appliances, not cooking, 5 applications, $554,000; electric irons, 3 applications, $378,000; domestic and commercial electric fans, 6 applications, $193,000; domestic watthour meters, 1 application, $70,000.

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International Hydro Told to Sue Paper Company

International Hydro-Electric System should sue International Paper Co. to recover substantial sums involved in various transactions bearing on the relationship of the two organizations, it was set forth in a report filed recently with the United States District Court at Boston as a result of an effort by the Securities and Exchange Commission to dissolve Hydro-Electric.

The recommendation was made by Bartholomew A. Brickley, an attorney who more than a year ago was appointed by the court to conduct an inquiry into the relationship of the two companies. SEC had asked the court to enforce its order that Hydro-Electric dissolve under the provisions of the public utility holding company act.

Court Will Interpret Holding Company Act

The Supreme Court has before it this week for decision the question of whether the dissolution of a company under section 11 (b) (2) of the Holding Company Act of 1935 matures the securities of the company or whether the continuing enterprise at the operating company level may prevent maturity of the holding company securities.

The question was argued before the high court by attorneys for Otis and Co., a Cleveland investment banking house which in 1929 underwrote a $60,000,000 preferred stock issue of the United Light & Power Co., top company of a vast holding-operating company system. U. L. & P. has been ordered dissolved by the Securities and Exchange Commission, which approved a dissolution plan providing that common stockholders would receive 5.48 percent of the assets, which are admittedly insufficient to cover charter obligations to the preferred stock.

Otis Counsel Albert Logan argued that the terms of the act required that the existence of U. L. & P. be terminated completely, that thus its securities must be considered matured, and that under the "absolute priority" rule laid down some time ago by the Supreme Court, junior securities could receive nothing until all charter obligations of the matured senior securities had been met.

Former U. S. Sen. Robert J. Bulkley, a member of the Senate at the time the Holding Company Act was passed, told the court of legislative intent that actions under Section 11 (b) (2) should liquidate companies treated thereunder.

THEIR GOAL, $5,000,000 IN WAR BONDS—Plans to achieve the $5,000,000 quota assigned to the 250 firms comprising the New York electrical industry in the Sixth War Loan Drive were made at a recent meeting of eight of the fifteen members of the Electrical Industry Division of War Finance Committee for New York. Front row: left to right, L. E. Latham, president, E. B. Latham & Co.; T. F. Barton, commercial vice-president, General Electric Co., and division chairman; H. C. Clement, assistant district manager, General Electric, and division co-chairman; W. V. Drury, vice-president, Graybar Electric Co.; R. B. Oliver, assistant to manager, Lamp department, General Electric. Rear row: Lee Kolker, Picker X-Ray Corp.; W. E. Addicks, district manager, Cutler Hammer, Inc.; W. J. O'Brien, WFC representative; W. E. Cotter, director, Commerce and Industry WFC for New York; J. H. Rothermel, assistant to manager, Westinghouse Electric & Manufacturing Co.; C. M. Hughes, WFC publicity; and Moses Blitzer, president, Lightolier Co.

Solicitor Roger Foster, representing SEC, argued that since the imposition of the "death sentence" upon a holding company does not interrupt the utility services rendered by subsidiary companies of the system, the possibility of earnings which would affect the value of the doomed company's securities remains. Where the possibility of earnings is such as to give any reasonable hope that obligations to preferred stock might be met and some equity for common stockholders remain, Foster argued, the SEC is not required under Section 11 (e) to accept only a dissolution plan which would overlook the possibilities of the continuing enterprise.

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FPC Budget Raise Requested for 1945

Anticipating the resumption of much of its normal work which had to be deferred during the war, the Federal Power Commission has asked for an appropriation for the fiscal year beginning next July 1 substantially larger than the budget of approximately $2,600,000 on which it is operating this year.

Considerable normal work was laid aside by FPC for the duration when its staff was reduced by more than 300 persons because of military leaves and transfers to war agencies. A large backlog has accumulated in licensing of hydroelectric projects and in cost determinations for federal multi-purpose river development projects. In addition, little has been done in the investigation of a number of unlicensed hydroelectric projects.

Considerable statistical work will be resumed when the war situation permits, but no attempt will be made to gather for the war years those statistics which were dropped for the duration. New editions of the "Directory of Electric Utilities" and the "Directory of Gas Utilities" are planned, as well as a new edition of "Electric Utility Cost Units and Ratios."

The commission's activities in the natural gas field will probably be considerably more extensive after the war than they were in the past. The commission has undertaken a general investigation of the industry which will occupy considerable attention for some months, and from which extensive revision of the agency's statutory duties in the gas field may result. Under a 1942 amendment of the Natural Gas Act, FPC is charged with determining service areas of all natural gas companies, which in itself will be an imposing job.

MEETINGS

Pennsylvania Electric Association—Meter committee, Benjamin Franklin Hotel, Philadelphia, Pa., December 14-15. B. M. Smith, chairman, P. O. Box 1101, Erie, Pa.

Previously Listed

American Society of Mechanical Engineers—Annual meeting, Hotel Pennsylvania, New York, N. Y., November 27-30. Ernest Hartford, executive assistant secretary, 29 W. 39th St., New York 18, N. Y.

National Exposition of Power and Mechanical Engineering — Madison Square Garden, New York, N. Y., November 27-December 2.

National Association of Manufacturers—Annual meeting, Waldorf-Astoria Hotel, New York, N. Y., December 6-8. J. M. Boyd, secretary, 14 W. 49th St., New York 19, N. Y.

American Standards Association — Annual meeting, Hotel Roosevelt, New York, N. Y., December 8. P. G. Agnew, secretary, 70 E. 45th St., New York 17, N. Y.

Technical Valuation Society—Annual forum and business meeting, Building Trades Club, 2 Park Ave., New York, N. Y., December 16. W. C. Fisher, chairman, Room 516, 4 Irving Place, New York, N. Y.

Missouri Valley Electric Association — Annual power sales conference, Continental Hotel, Kansas City, Mo., January 17-18. I. D. Pettegrew, director, 1527 Sharp Bldg., Lincoln 8, Neb.

American Society of Civil Engineers — Annual meeting, Commodore Hotel, New York, N. Y. January 17-19. George T. Seabury, secretary, 33 West 39th St., New York 18, N. Y.

American Institute of Electrical Engineers—National technical meeting, Engineering Societies Bldg., New York, N. Y., January 22-26. H. H. Henline, secretary, 33 West 39th St., New York 18, N. Y.

Institute of Radio Engineers—Winter technical meeting, Hotel Commodore, New York, N. Y. January 24-27. W. B. Cowlich, secretary, 330 W. 42nd St., New York 18, N. Y.

Samuel W. Murphy Dies

Samuel W. Murphy, president of the Electric Bond & Share Co., New York, died on November 19 of a heart attack at his home in South Orange, N. J. He was 52 years of age. Mr. Murphy became president of Electric Bond & Share in 1941, after a long career in its legal department.

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Toledo Edison to Expand

Toledo Edison Co. will spend $90,000 to expand facilities of its Defiance, Ohio, division. Additional transmission facilities will cost $55,000, and $35,000 will be spent for improvements at the dam across the Auglaize River at the company's hydroelectric plant south of Defiance.

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Surveying Snake River

A survey of the Snake River near Caldwell, Idaho, is being made by the United States Coast and Geodetic Survey for use in river developments.

Detroit Edison Co. Appeal Continues in Circuit Court

Declining to dismiss the appeal of the Detroit Edison Co. from a State Public Service Commission order to rebate $10,450,000 to its customers to avoid payment of federal excess profits taxes, Circuit Judge Archie D. McDonald has ordered the litigants to submit further arguments.

The judge upheld the contention of the Detroit Edison Co. that the court order must consider fully testimony taken by it before it issued its rebate order. The court also ordered attorneys for both parties to argue the relationship between voluminous testimony taken by the Commission and evidence submitted to the court at a hearing early in October.

Judge McDonald ruled that the OPA had a legal right to intervene in the case in the interests of consumers.

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Seeks Income Tax Refund

The Arkansas-Missouri Power Corp. has asked income tax refunds totaling $3,337.98 in a suit filed against Arkansas Revenue Commissioner Murray B. McLeod in Pulaski Circuit Court, October 30.

The company charged that it had been assessed unlawfully for income taxes on dividends received from holdings in the East Missouri Power Co. The company operates electric and ice plants, with headquarters at Blytheville, Ark.

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London 'Dimout' a Failure

London, which quickly established successful "blackout" rules at the beginning of the war, finds that it will take much longer to nullify their effects. Last month, rules were changed to permit a "dimout," but after a lot of joyous talk, little happened. For a number of reasons people are still using their old "blackout" curtains, and street lighting is still absent because it has not been possible to install new equipment.

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Will Change Billing System

East Palestine, Ohio, will change the method of billing the customers of its municipal light and power plant. Bills will be for the net instead of gross amount, and penalties will be added for failure to meet payment dealline. The new plan is intended to reduce bookkeeping.

Electric Output Curve Gains More Ground

The output curve continued to move upward during the week ended November 18, 1944, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power industry amounted to 4,450,047,000 kw.-hr., as compared with 4,396,595,000 kw-hr. the preceding week ended November 11, 1944. Figures for the week represented a decrease of 1.4 percent under the 4,513,299,000 kw.-hr. distributed during the corresponding week a year ago.

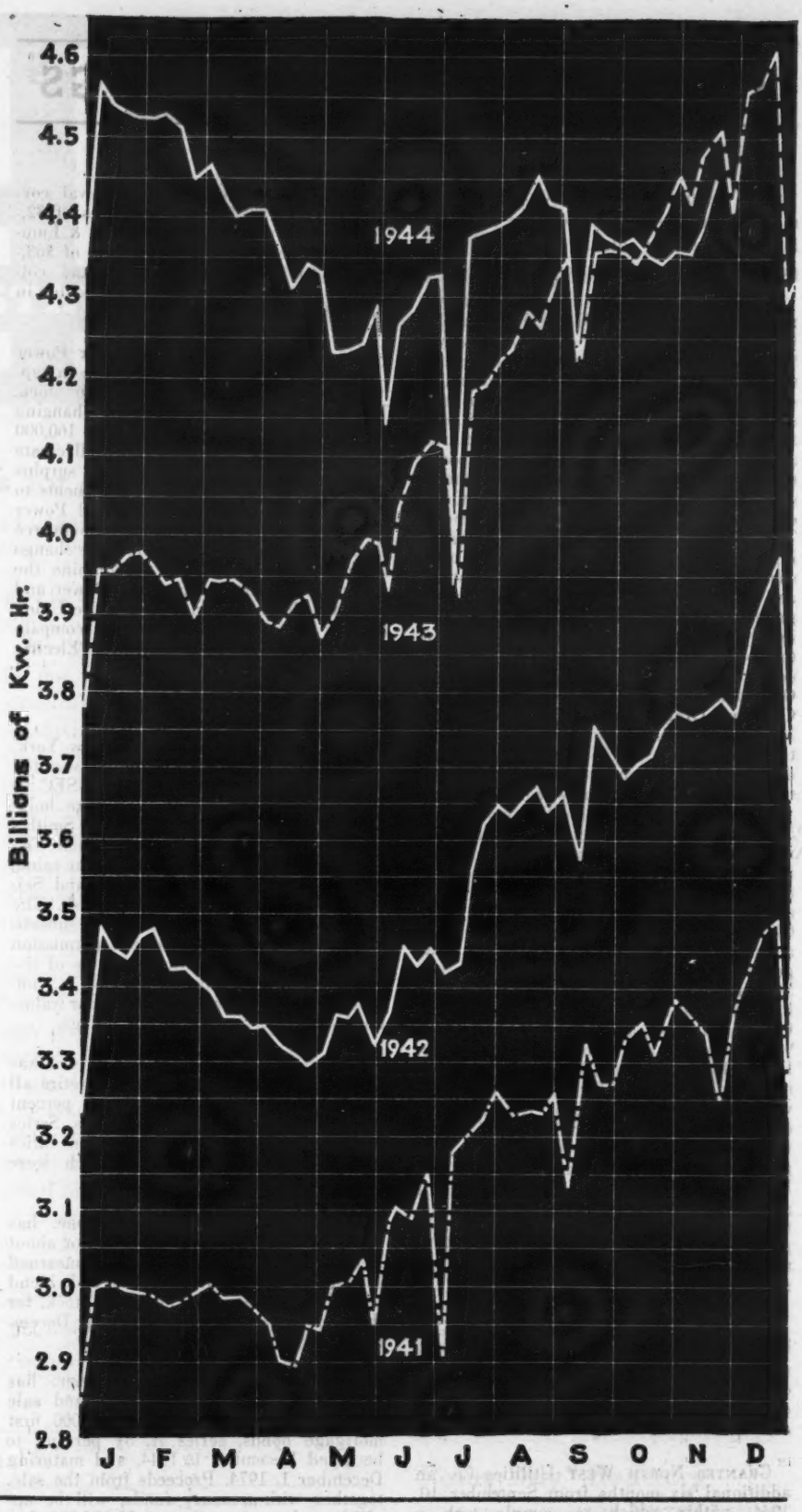
Only three of the seven major geographic regions of the country reported losses for the week ended November 18, 1944, as compared with the corresponding week in 1943, the Central Industrial group returning to the plus column with a gain of 1.4 percent. It reported a loss of 0.7 percent for the week ended November 11, 1944, as compared with the corresponding week of 1943. The only substantial regional change was reported by the West Central States, which showed an increase of 7.0 percent for the week ended November 18; they reported a gain of only 3.6 percent for the week ended November 11.

Weekly Output Millions Kw.-Hr.

1944		1943		1942	
Nov. 18	4,450	Nov. 20	4,513	Nov. 21	3,795
Nov. 11	4,397	Nov. 13	4,483	Nov. 14	3,776
Nov. 4	4,355	Nov. 6	4,414	Nov. 7	3,762
Oct. 28	4,358	Oct. 30	4,453	Oct. 31	3,775
Oct. 21	4,345	Oct. 23	4,415	Oct. 24	3,753
Oct. 14	4,355	Oct. 16	4,382	Oct. 17	3,717
Oct. 7	4,375	Oct. 9	4,342	Oct. 10	3,702
Sept. 30	4,366	Oct. 2	4,359	Oct. 3	3,683
Sept. 23	4,377	Sept. 25	4,360	Sept. 26	3,720
Sept. 16	4,395	Sept. 18	4,359	Sept. 19	3,757
Sept. 9	4,228	Sept. 11	4,229	Sept. 12	3,583
Sept. 2	4,415	Sept. 4	4,351	Sept. 5	3,673

Percent Change from Previous Year

	Week Ending		
	Nov. 18	Nov. 11	Nov. 4
New England	+ 0.9	+ 1.7	— 0.0
Mid Atlantic	— 5.2	— 5.0	— 4.0
Central Industrial	+ 1.4	— 0.7	+ 0.5
West Central	+ 7.0	+ 3.6	+ 2.6
Southern States	+ 2.8	+ 2.8	+ 2.4
Rocky Mountain	—12.6	—12.2	—10.6
Pacific Coast	— 4.3	— 3.2	— 0.3
Total United States	— 1.4	— 1.9	— 1.3



September Load Demand in Ontario Up Over 1943

Total primary load demand for September on Southern Ontario and Thunder Bay systems and Northern Ontario properties exceeded by more than 48,000 horsepower the total for the corresponding month of 1943, it was shown in the monthly load summary released by the Hydro-Electric Power Commission of Ontario. Figures showed a 15 percent increase in the Thunder Bay system primary load, which the commission attributed to the load supplied to Steep Rock Iron Mines at Atikokan, Ont. Total horsepower was 116,756, compared with 101,233 last September.

Canadian Union Loses

An appeal of the Canadian Electrical Trades Union, Branch No. 1, against the Ontario Regional War Labor Board's refusal to authorize three weeks vacation with pay for employees of the Toronto Hydro-Electric System has been dismissed by the War Labor Board.

SEC DECISIONS—HEARINGS

The Securities and Exchange Commission, in a series of orders recently issued affecting electric utility companies:

APPROVED AMENDED plan of recapitalization of the Standard Gas & Electric Co. Under the plan holders of the company's $52,000,000 outstanding notes and debentures are to receive forty shares of common stock in five subsidiary operating companies with an assigned value of $695.05 and $304.95 cash for each $1,000 of debentures and notes. Standard Gas further proposes to issue 5,020,134 shares of new common stock to be distributed to holders of its outstanding preferred stocks as follows: Ten and one-half shares for each outstanding $7 prior lien preferred share, nine shares for each share of $6 prior lien stock and one-third share for each share of $4 preferred stock. Shares of common stock in the subsidiaries would be distributed in the following ratios: Eighteen of the Wisconsin Public Service Corp., twelve of the Oklahoma Gas & Electric Co., five of the California-Oregon Power Co., two of the Mountain States Power Co. and three of the Pacific Gas & Electric Co. Proposed distribution by Standard Gas would mean that 95 percent of its new common stock would go to the two prior lien stocks and 5 percent to the $4 preferred stock. SEC ruled that the present common stock had no equity and so its holders were not entitled to participate under the plan. Standard Gas would borrow not more than $12,000,000 on three year notes from banks to augment its cash to effectuate the proposals. After the plan is consummated Standard Gas will have as principal assets its interest in the Louisville Gas & Electric Co. of Delaware, a holding company, and 97 percent of the common stock of the Philadelphia Co. of Pittsburgh. Negotiations are in progress for sale of the Louisville Gas & Electric Co. of Kentucky, an operating subsidiary, to the City of Louisville. If negotiations are unsuccessful it is proposed to liquidate and dissolve the Delaware company. Standard Gas would get its proportionate share of the assets, the common stock of the Kentucky company. Following consummation of these transactions, Standard Gas would be merged with the Philadelphia company.

PERMITTED PURCHASE by Public Service Co. of Colorado of 4,000 shares of common stock of Home & Electric Co. for a cash consideration of $112,000. The purchase represents 20 percent of Home Gas common stock.

GRANTED NORTH WEST Utilities Co. an additional six months from September 10, 1944, within which to comply with a "death sentence" order. The company, which is a subsidiary of Middle West Corp., was ordered by the commission on September 10, 1943, to liquidate and terminate its existence.

APPROVED PAYMENT of legal fees and expenses incurred by the Illinois Power Co., a subsidiary of the Illinois Traction Co., in refunding of the former's Series C 5 percent and series A 6 percent first and refunding mortgage bonds. Approval covered a fee of $27,500 and expenses of $2,902 for Donovan, Leisure, Newton & Lumbard, attorneys for the purchasers of $63,000,000 of new first mortgage and collateral trust bonds, 4 percent series, due in 1973, of Illinois Power.

HAS APPROVED Mississippi River Power Co.'s proposed $4,800,000 reduction in capitalization represented by common stock. The reduction is to be made by changing from $100 to $70 the par value of 160,000 common shares. This reduction will create part of the $14,360,000 capital surplus necessary for plant account adjustments to comply with orders of the Federal Power Commission and the Illinois Commerce Commission, the company said. The change is preparatory to a plan to combine the properties of Mississippi River Power and the Iowa Union Electric Co. and the Union Electric Co. of Illinois. All three companies are subsidiaries of the Union Electric Co. of Missouri.

Applications Filed

ASSOCIATED UTILITIES CORP., New York, a subsidiary of trustees of the Associated Gas & Electric Corp., has asked SEC to allow sale of the company's entire holdings of common stock of Paul Smith's Electric Light & Power & Railroad Co., consisting of 1,250 shares of $100 par value, to Paul Smith's College of Arts and Sciences, New York, for $60,000 cash. The Gas and Electric Associates, also a subsidiary of Associated Gas, sought permission to sell the former's entire holdings of the common stock of Smith's Electric Co., consisting of 4,977 shares of $100 par value, for $240,000 cash, also to the college.

CONSOLIDATED ELECTRIC & GAS Co. has asked the SEC for permission to retire all of the outstanding thirty-year 5 percent first-lien and collateral trust bonds, Series A, due April 1, 1958, of Southern Cities Utilities Co., $5,082,000 of which were outstanding on September 25.

GENERAL GAS & ELECTRIC CORP. has asked approval of the payment on or about December 15 out of capital or unearned surplus of the regular quarterly dividend of $1.25 on its $5 prior preferred stock, for the current quarterly period ending December 15, 1944.

ARKANSAS-MISSOURI POWER CORP. has asked for approval of the issue and sale at competitive bidding of $2,000,000 first mortgage bonds, series A, 3¼ percent, to be dated December 1, 1944, and maturing December 1, 1974. Proceeds from the sale, together with treasury funds, will be applied to the redemption of $2,350,000 first mortgage bonds, series A, 4 percent, due June 1, 1965, now outstanding.

NORTH AMERICAN CO. has asked approval of the dividend recently declared by its directors payable on January 2, 1945, to stock of record on December 1 in common stock of the Pacific Gas & Electric Co. at the rate of one share of Pacific Gas common on each 100 shares of North American common.

GULF PUBLIC SERVICE CO., INC., applied for exemption from provisions of the Public Utility Holding Company Act. Gulf claimed exemption because its sole subsidiary, Louisiana Public Utilities Co., Inc., operates within the same state.

UNITED LIGHT & RAILWAYS CO. has filed a plan for the liquidation of American Light & Traction Co. As an initial step, American Light is to deposit $13,403,100 in trust for the redemption of 536,324 shares of outstanding 6 percent cumulative preferred stock at the par value of $25 a share plus accrued dividends. After the redemption, American Light would distribute its remaining assets among holders of 2,768,050 shares of common stock. A detailed plan of distribution is to be filed with the commission at a later date.

CENTRAL MAINE POWER Co. has filed a plan for liquidation of the Portland (Me.) Railroad Co. Liquidation would follow retirement of the securities. Central Maine Power holds a ninety-nine-year lease on Portland Railroad, acquired in a merger with the Cumberland County Power & Light Co. in 1942. Central Maine Power proposes to sell Portland Railroad's bus system operating in and about Portland and to buy the real estate assets now leased by it "at a fair price." Portland Railroad would retire its publicly-held stocks and bonds with the proceeds.

WEST VIRGINIA LIGHT, HEAT & POWER Co. has asked approval of the sale by it of its electric production, transmission and distribution system to the Monongahela West Penn Public Service Co. for a base cash consideration of $427,633, subject to certain adjustments, and dissolve.

Hearings Scheduled

DECEMBER 1: On application of North Continent Utilities Corp. and its subsidiaries for an extension of one year from November 16, 1944, in which to comply with an order of the commission directing North Continent to liquidate and dissolve. The order was entered on November 16, 1943.

DECEMBER 5: On reasonableness of approximately $84,000 in fees and expenses incurred by International Utilities Corp. in connection with its recently approved recapitalization plan.

UTILITY REPORTS

	Net Income 1944	1943
*American Gas & Electric and subs	$11,914,161	$12,622,607
†Central Maine Power	3,246,689	3,362,528
*Columbia Gas & Electric and subs	11,410,043	11,860,386
*Columbus & Southern Ohio Electric	2,773,470	3,244,720
*Community Public Service	712,167	518,827
*Engineers Public Service and subs	6,412,784	5,823,627
*North American and subs	19,491,377	18,864,822
*Oklahoma Power & Water	101,041	121,254
*Puget Sound Power & Light and subs	4,533,224	4,423,258
*Wisconsin Electric Power	4,049,542	4,379,720
*Wisconsin-Michigan Power	656,469	704,664

* Twelve months ended September 30.
† Twelve months ended October 31.

HOW

DESIGN · CONSTRUCT · OPERATE · MAINTAIN

Ground Temperatures for Cable Loading

By ARCHIE BENJAMIN

Electrical Dept., Distribution Engineering Division, Quebec Hydro-Electric Commission

In order to obtain basic ground temperatures to be used in calculating the allowable loading of 120-kv. oil-filled cables, two locations were chosen for measurements:

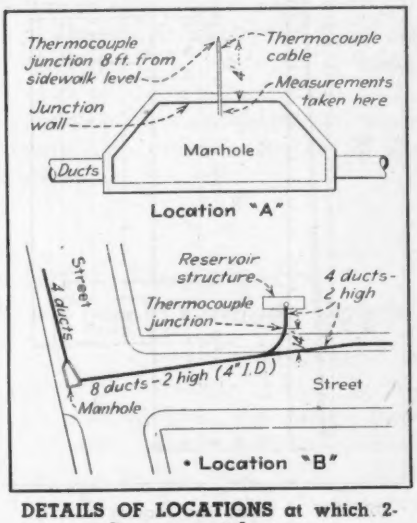
(a) In a manhole at a hotter-than-average section a hole was cut through the concrete wall along which the cable joints were trained, and a piece of 2-conductor thermocouple cable was inserted so that the junction was approximately 4 ft. from the inside face of the manhole and at a depth of 8 ft. from the sidewalk level. The other end of the thermocouple cable was left open in the manhole ready to be attached to a portable Leeds & Northrup Galvanometer Potentiometer Indicator to read degrees Centigrade directly.

(b) A vacant 4-in. I.D. fibre duct extending from a manhole to a reservoir structure at a location entirely removed from foreign sources of heat and approximately 2 miles from the first location was used for a second installation of the thermocouple cable.

The 2-conductor cable was installed in the vacant duct at the reservoir structure end so that the junction was approximately 4 ft. deep measured from the ground level and approximately 14 ft. west of the power cables. The manhole end of this duct was plugged tightly. The other end of the thermocouple was left open at the structure ready for potentiometer readings.

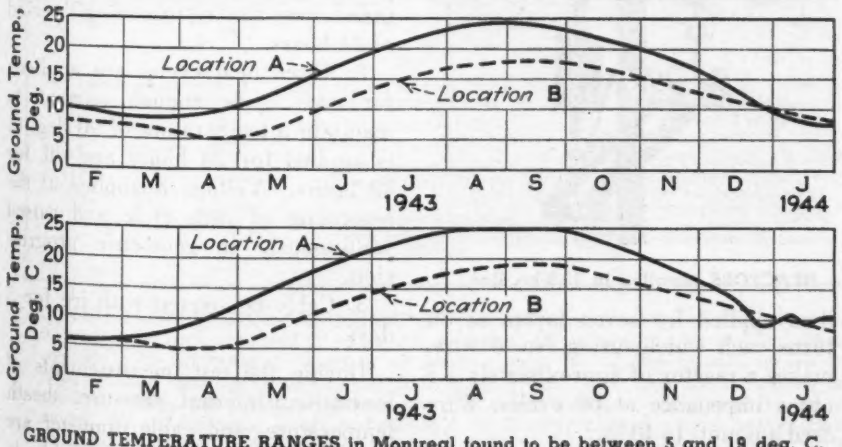
In both cases the 2-conductor thermocouple cable consisted of 1—No. 14 (7 strands No. 22) tinned copper, and 1—No. 14 solid tinned Constantan, $\frac{1}{32}$ in. 30 percent rubber and single dry colored braid around each conductor, jute fillers and 40 percent Neoprene compound covering and finally an overall covering of weatherproof braid.

A temperature reading was taken at each location every week and it was found that at the first location the ground temperatures were several degrees higher (maximum 6 deg.) for the greater portion of the year, but coincided with the reading at the second location at times. A value between the two readings was usually chosen for loading purposes.



DETAILS OF LOCATIONS at which 2-year readings were taken

In B it was 161 ft. from manhole to the reservoir structure. Thermocouple junction approximately 4 ft. deep. Three of the four ducts entering the reservoir structure contain two copper oil-pipes each; the fourth contains the thermocouple cable, closed at manhole end. Three of the four ducts passing the reservoir carried power cables.



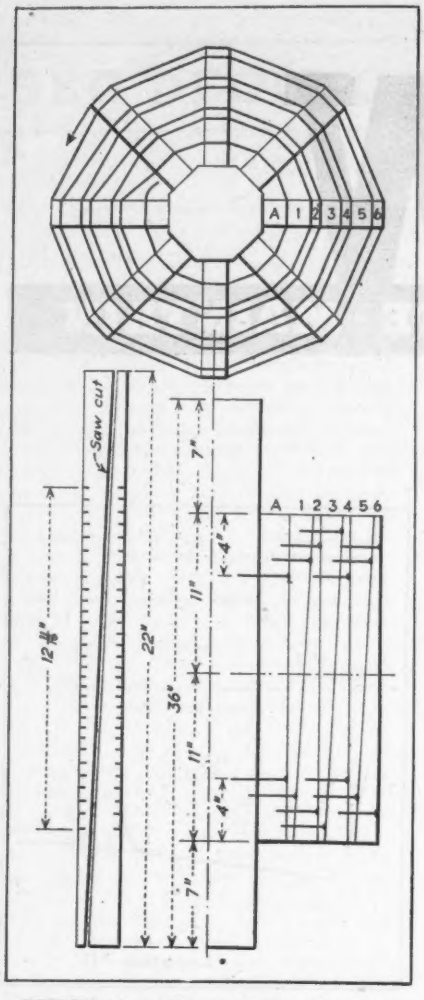
GROUND TEMPERATURE RANGES in Montreal found to be between 5 and 19 deg. C. for one location and 6 and 25 for another

"Rainy Day" Reactors for Rural Lines

By R. W. McEVER

Knoxville Electric Power & Water Board

Short circuit capacity was so high at several places on the system of the Knoxville (Tenn.) Electric Power & Water Board from which 13.8-kv. rural lines extended that it was im-



DESIGN of rural line reactor

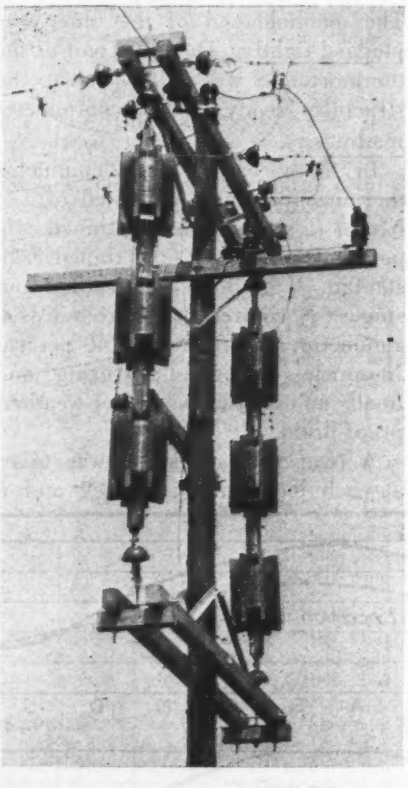
possible to secure satisfactory coordination of fusing on these lines. Result was that service to farm customers was not what it should be. The obvious remedy was to insert reactance at these points. Because of war-time materials restrictions, new equipment was not available for this much-needed service improvement and it was necessary to construct the needed reactor coils in the utility shop by utilizing surplus materials and the labor of outside crews on rainy days.

Rather than to build reactors specially designed for the conditions of each location, the decision was to mak only one size, using one or more of them per lead as was required in the particular case. As may be seen in the accompanying picture and drawings, the design evolved is very simple.

Core and suspension support of the reactor is an octagonal piece of fir 3 ft. long, each side $1\frac{1}{2}$ in. wide, $3\frac{3}{4}$ in. between opposite sides, cut out of a standard cross-arm. On each face of the core are a series of wood spacers which separate the layers of the wire coil and are slotted to hold the turns. The eight spacers next to the core are of $1\frac{1}{4}$-in. square section; the 24 others are flat tapered so as to provide maximum separation between layer-end turns where greatest potential differences will exist. The spacers are notched or slotted 11/64 in. deep, $\frac{7}{16}$ in. spacing between slots, 30 slots. The tapered spacers are made by cutting diagonally a $1\frac{1}{4}$ in. by $1\frac{3}{8}$ in. piece 22 in. long, thus two spacers from each piece. At the large end each spacer is $1\frac{1}{2}$ in. wide and $\frac{13}{16}$ in. thick; same width and $\frac{7}{16}$ in. thick at the small end. All spacers are boiled in linseed oil and then painted with Glyptal varnish.

Assembly Details

Assembly of the reactor begins with attachment of the first base spacers to the sides of the core with wood screws. Then the first layer of 30 turns is wound on in the spacer slots. Next the first eight tapered spacers are screwed on, holding the first layer of bare wire in place and providing slots for the second layer. Spacers and wire are



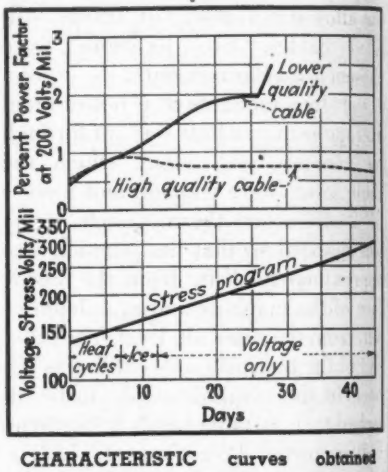
REACTORS installed in 13.8-kv. line

thus applied for seven layers of 30 turns each which, using No. 6 wire, makes a reactor of approximately 1.5 ohms impedance at 60 cycles. Wire used amounts to 48 lb.

Field checks of short circuit current were made to determine locations at which reactors should be installed and how many units should be used. At some places only two units per phase were required; at others three or four and in one case, six. At one location where before and after checks were made, three reactors per phase reduced short circuit current on a 13.8-kv. circuit from 795 to 420 amp. In all installations reactors are paralleled with lightning arresters to by-pass lightning and other surges.

Test Method Hastens Cable Aging

A method of accelerating cable age has recently been found by General Cable Corporation which in weeks gives the equivalent of years of service.



CHARACTERISTIC curves obtained during accelerating tests on cables

The test procedure is as follows:

1. The cable is heated to 95 deg. C. at such a rate of increase that the cable pressures do not exceed 100 pounds per square inch and is so maintained for a "seasoning" period of 24 hours.

2. Three heat cycles are applied; for each cycle enough current to maintain a temperature of 90 deg. C. is applied for 24 hours and off for 48 hours. Voltage is applied at the beginning of each cycle and raised continuously in geometric progression.

3. Cable is covered with ice for 5 days.

During the test, measurements of ionization, internal pressure, sheath temperature, and cable diameter are made. After the test the cable is

dissected for inspection. Radial power factor tests and styrene wafers are made before and after the aging procedure.

It is believed that accelerated aging tests were first developed by the Detroit Edison Co. in which the voltage stress was increased by definite steps. General Cable has now developed a procedure which eliminates these large steps and uses a stress program about 22.5 percent higher but substantially equivalent to the Detroit company program with the exception that the stress is varied to give a uniform rate of rise corresponding to a 20 percent voltage increase over a period of 9 days.

• • •

Rectox-Operated Circuit Breakers

By B. I. HAYFORD
Switchgear Engineer, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

Control schemes now in general use for copper-oxide operated breakers consist of a.c. operated breaker control and cut-off relays of various types using control schemes similar to those used for d.c. operated breakers.

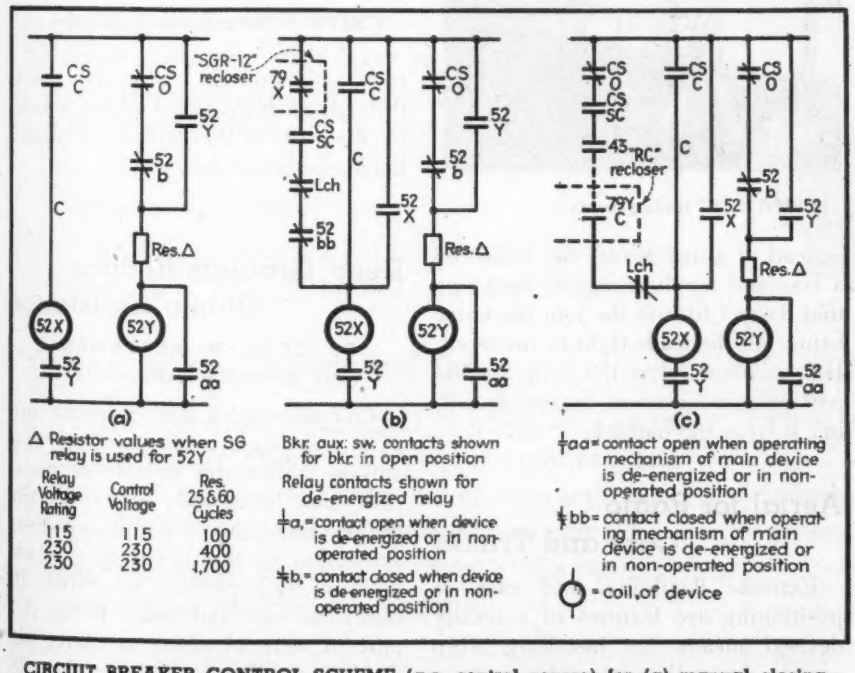
When the a.c. source for control is the system in which the breaker is connected, this type of control is not anti-pumping under all conditions. Thus, if the breaker closes on a low impedance fault across the phases from which the operating potential is obtained, the a.c. voltage will collapse, permitting control relays and breaker to drop open from loss of voltage before it is fully closed. As soon as circuit interruption occurs, voltage is reestablished—the breaker will reclose and repeat as long as the operator holds the control switch in the "close" position. The reclosures are so rapid that several may occur before the operator can release the handle.

The new standardized control scheme, as shown in the illustration, overcomes the possibility of pumping. It sets up the closing sequence with the cut-off relay energized through an "off" contact on the control switch. Thus, if there is a momentary loss of voltage during the closing operation the relay will drop open and prevent a reclosure of the breaker until the control switch has first been turned to the "off" position and reclosed.

It will be noted that in diagrams (b) and (c) the "anti-pump" connections function only for manual operation from the control, since reclosure relay schemes are completely "anti-pump" in themselves. These differ from the manual closing scheme only in requiring the use of a "seal in" contact for the breaker control relay.

In order to obtain the desired sequence of operation with the simplest use of devices and wiring, the cut-off relay is continuously energized in series with its resistor when the breaker is open since the power consumption is very small.

This simple adaptation of the conventional "XY" closing relay scheme used on d.c. control circuits to a.c. circuit breaker closing circuits insures anti-pump operation under all conditions.



CIRCUIT BREAKER CONTROL SCHEME (a.c. control source) for (a) manual closing, (b) single-shot reclosing, and (c) three-shot reclosing, CS = control switch, C = close contact, O = off contact, closed in off position only, SC = slip contact, closes in close position and opens in trip position. Note: When other than control switch is used for closing, the C and O contacts must be closed and open contacts of the same device. 43 = automatic cutoff switch. 52X = breaker closing control relay. 52Y = breaker clossing cutoff relay. 79X and 79Y6 = recloser relay contacts. LCH = latch check switch .

• •

Safety Measures For Cold Cathode Lighting

Nearly everything that goes into any modern factory or building must be studied from the safety angle, and cold cathode lighting is no exception to the rule. With normal care this type of lighting will have a high enough factor of safety to satisfy any safety engineer, according to an engineering service release of the Acme Electric & Manufacturing Co., Cuba, N. Y.

The question concerning series connected fluorescent light is not "does a risk exist?" but rather "how great is the factor of safety?" The answer is that the accident experience is surprisingly low. In fact, the company has not been able to unearth a single fatality.

However, even though such an excellent record exists, the ever increasing acceptance of cold cathode lighting calls for systematic attention to safety measures, bearing in mind that the wider the acceptance, the greater the damage due to maintenance by unskilled persons. Some of the safety steps which can be taken, according to the engineering release, are as follows:

1. Enclose all transformer terminals in such a way that it is impossible to touch accidentally live metal parts.

2. Use completely enclosed, rugged

sockets so arranged that in changing tubes it will be impossible to bridge any appreciable voltage with the hands.

3. Mount all tubing and connections so that they cannot be reached from the floor, or in any other manner, except with deliberate intent.

4. Do not use series tubing in damp locations or where the atmosphere is filled with explosive dust or vapor.

In listing these simple measures an assumption has been made that most cold cathode lighting will be of the series type.

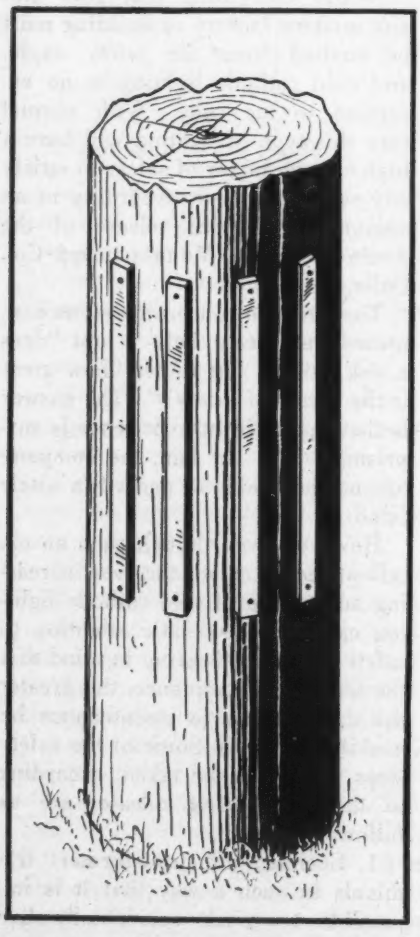
•

White Laths Protect Public and Poles

An eastern utility has devised a simple, effective and inexpensive method of making creosoted poles more visible to car drivers during evening hours; it also is effective during periods of heavy fog.

The method is the tacking of four or five white-painted building laths on the creosoted poles. The laths are previously painted in the company paint shop.

On a day not suited for climbing because of fog or intermittent showers, the line crew tacks the prepared laths on the poles at headlight-beam levels.

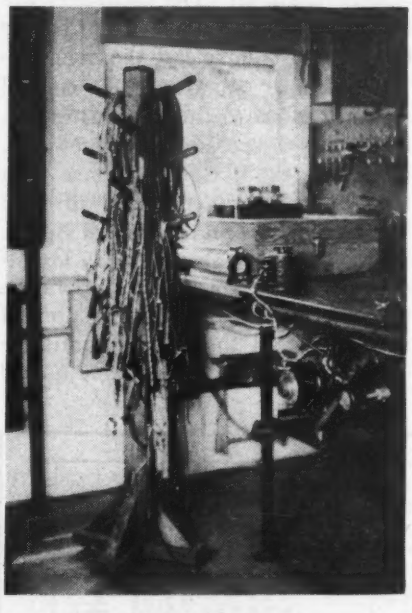


WHITE LATHS on creosoted pole make a neat and effective pole marker

•

Hatrack for Testing Leads

Noted in the testing shop of the East Tennessee Light & Power Co. is a handy device for holding leads. It is a sort of hatrack, a wood column about 6 feet high and 6 in. square down each side of which are five inclined wooden pegs over which the leads are hung. The column is mounted on a heavy wood base fitted with large, easy-rolling casters. Thus,



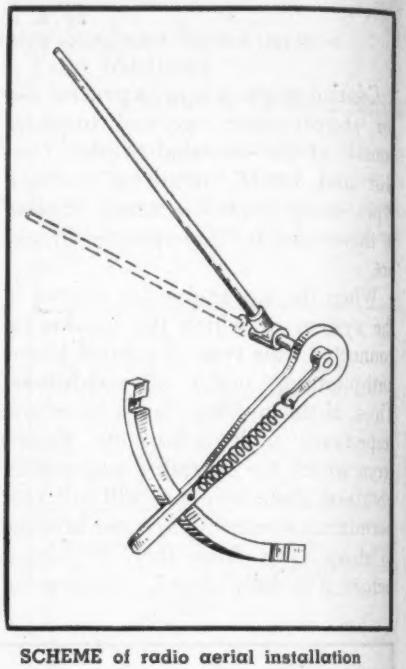
PERIPATETIC testing leads

instead of going across the room for a lead and maybe bringing back one that doesn't fit into the job, the tester brings all the leads right to the work. He can then select the lead for the particular connection by merely lifting it from the hatrack.

•

Aerial for Radio Cars and Trucks

Extreme flexibility and ease in positioning are features of a locally devised means for installing whip aerials on radio-equipped cars and trucks of the Roanoke Division of the Appalachian Electric Power Co. The scheme is shown in the accompanying sketch. The aerial rod on the outside of the car is set in an insulating hub from which a short shaft passes through the side of the body above and behind the driver's seat. Inside the body is mounted a quarter circle of metal strip which is slotted for three positions of the aerial, up, half-up and down. The operating handle is connected to the aerial by a long, soft spring so that the aerial can be deflected through a half circle in any position of the handle. The aerial lead of flexible wire is soldered to the rod and brought into the truck through an insulating bushing which, by the way, is the drilled-out plastic handle of a screwdriver.



SCHEME of radio aerial installation

•

Deep Grounds Reduce Ohmic Resistance

By LLOYD M. REBSAMEN*
Jonesboro, Arkansas

Comparison of 8-ft. grounds and 27-ft. grounds demonstrates that sinking below the permanent moisture level materially decreases the ohmic resistance. Results of tests show that of the 723 deep grounds 682 or 94.3 percent measured 10 ohms or less and only 41 or 5.7 percent were 11 ohms or more, but not one reading was higher than 28 ohms. The major portion of the installations were in the two, three or four ohm bracket, 49 showed zero

* Formerly Manager & Engineer, City Water & Light Plant, now secretary-treasurer Barton-Mansfield Co.

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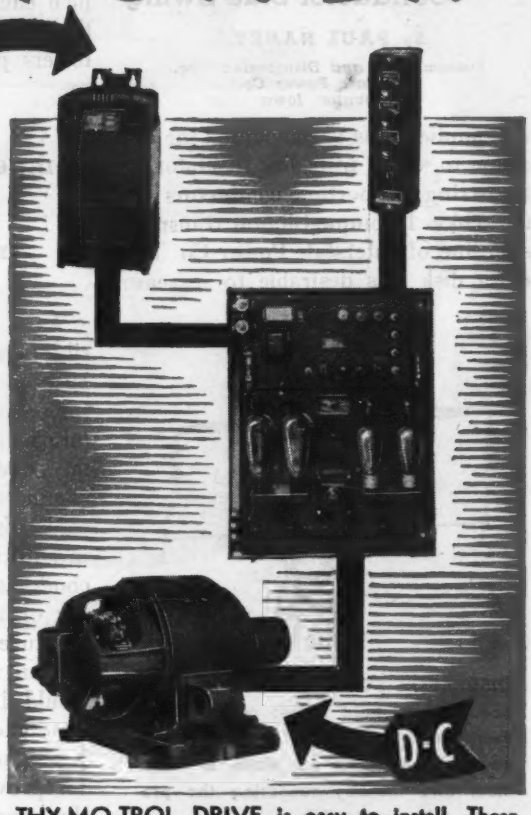

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resistance, and 64 measured only one ohm.

The readings obtained on the 381 original 8-ft driven grounds show that only 57 or 14.9 percent were 10 ohms or less and the remaining 324 or 85.1 percent varied from 11 ohms to as high as 800 ohms.

All grounds were individually tested with a "Direct-R" Ground Tester. The method of installing the 27-ft. grounds was previously published in the ELECTRICAL WORLD, Sept. 5, 1942, page 58.

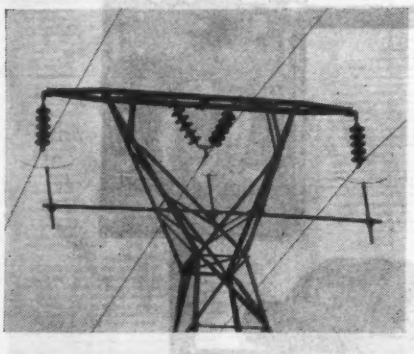
•

Double String Stops Conductor Side Swing

By PAUL NANEY

Transmission and Distribution Eng.
Interstate Power Co.
Dubuque, Iowa

Complications accompanied the decision to add a fifth disk insulator to the string supporting conductors on the 69-kv. Dubuque-Clinton transmission line of Interstate Power Co. The extra disk was desirable to increase



INSULATOR STRINGS in V configuration, above, hold center conductor in semi-rigid position — prevent wind swaying conductor too close to tower steel and thereby rendering the protector tube ineffective

the insulation level of the line and render the coordination between insulator flashover and protector tube external gap less critical. With the fifth disk added, however, clearance to tower steel on the center conductor was too small for safety. During heavy winds the conductor could swing enough to encourage impulse flashover to tower steel rather than through the protector tube.

This tendency of the center conductor-insulator assembly to swing was corrected by replacing the original four-unit center string with two 5-unit strings installed in a V configuration, as shown in the accompanying illustration. This held the center conductor semi-rigid so that it could not be displaced by wind.

Addition of the extra disk on the two other phases permitted the external gap between conductor and protector tube to be increased from 4 in. to 5½ in. This gave the tube a better opportunity to function as intended and rendered the coordination much less critical, improving reliability of operation.

The task of adding the insulators to the 332 structures in the 55¾-mi. single-circuit line was done with the line de-energized during seven successive Sundays. Seven tower crews of three men each were used. It is estimated that each crew averaged about seven towers per day.

•

Temperature Correction for Short Conductors

By JEROME J. TAYLOR

The Detroit Edison Co.
Detroit, Mich.

As a step in determining permissible loadings of wires, cables and buses a method has been developed for correcting the midpoint temperature of a sample or a test section of the conductors. Terminals of short conductors are often warmer or cooler than the middle portion. Hence in addition to the I^2R heating in the conductor, the terminals are furnishing or removing heat, and the temperature rise at the midpoint of the section will be higher or lower than would be obtained on a very long conductor. This method is useful for estimating proper sample lengths, for proving that in particular setups the correction is negligible, and for increasing the reliability of the results in cases where the length of a test section is limited.

Determining Temperature Difference

The number of degrees difference between midpoint temperature and the average of the two terminal temperatures is obtained from actual measurements. A curve has been developed and shows the factor by which to multiply this difference in order to get the correction to the midpoint temperature. The horizontal scale for the curve is the thermal attenuation of the test section, and is obtained by multiplying the length of the section, in feet, by values dependent on conductor characteristics and type of cooling. The latter are per-foot values of attenuation and can be calculated as described later.

Mathematical Basis

This method is based on standard mathematics for uniform lines, the textbook analogy being a d.c. line, open at the far end. It involves the assumptions that I^2R heating is constant over the length of the sample and that heat transfer is proportional to temperature difference between conductor and surrounding medium. In practical cases these conditions are usually close to being met, and the two most common deviations tend to cancel each other. Within these limitations it can be shown that the correction factor (ordinates of the curve) equals

$$1/((Cosh\ (A/2)) - 1),$$

where A is the thermal attenuation of the test section. The attenuation equals $\sqrt{r\ h}$, r being the thermal resistance of the conductor in degrees per watt, and h the heat transfer coefficient in watts per degree temperature difference.

For copper conductors a formula with more familiar quantities is:

$$a = (0.00012\ I/C)\ (\sqrt{(663 + 2.82\ T/T_0)}$$

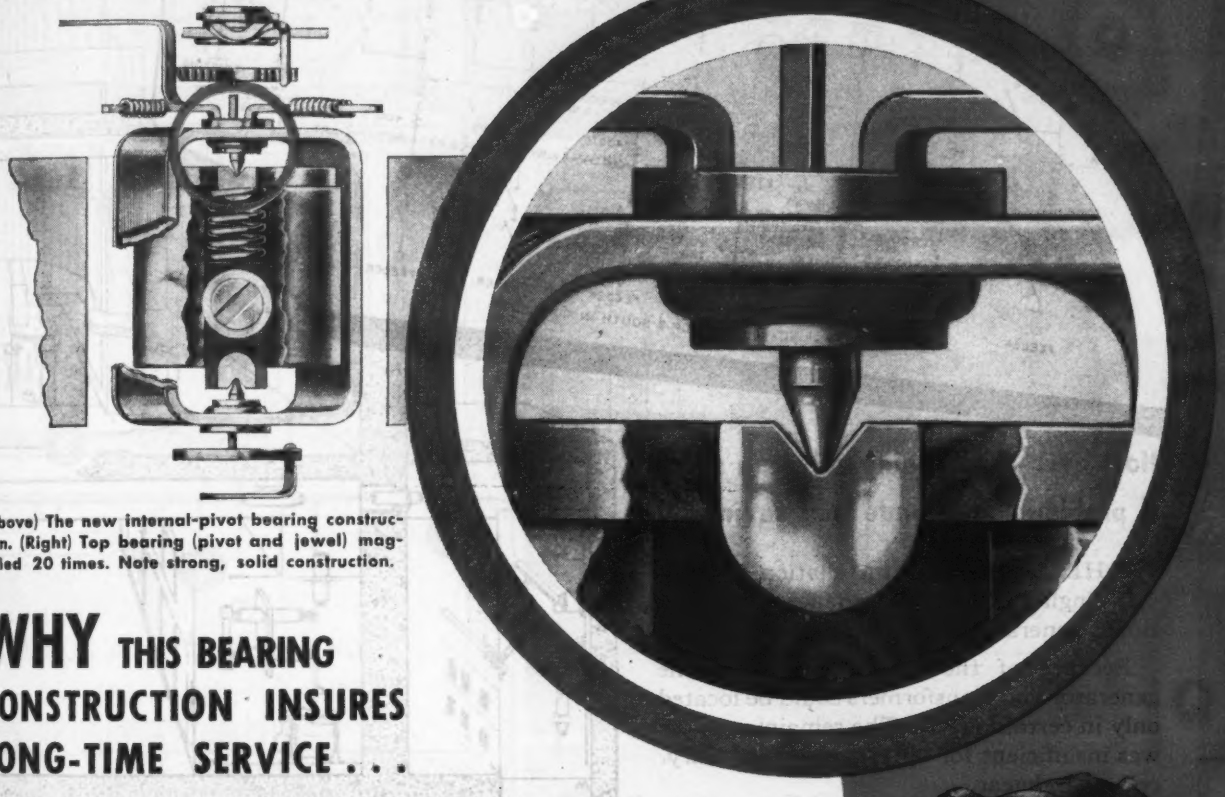
where a is the attenuation per foot length, I is the current in amperes, C is the conductor cross-section in square inches, T is average temperature of the test section in degrees Centigrade, and T_0 is the temperature rise above the surrounding medium, for a very long conductor (use the rise at the midpoint of the test section as a first approximation, and refigure a subsequently if greater accuracy is needed.) This expression takes account of changes in thermal and electrical resistivity of copper, with temperature changes. Similar relations for other conductors can be made up quite easily if their properties are known. Such expressions apply to any type of cooling that meets the original assumption, and the method is therefore capable of fairly wide application.

Data and example for this method will be presented in a subsequent issue of this publication.

New INTERNAL-PIVOT ELECTRIC INSTRUMENTS

2½-inch - - - 1 inch deep

For radio and other communications service; d-c voltmeters, ammeters, milliammeters, microammeters, and radio-frequency ammeters and milliammeters (a-c thermocouple type). Cases are brass or molded Textolite.



(Above) The new internal-pivot bearing construction. (Right) Top bearing (pivot and jewel) magnified 20 times. Note strong, solid construction.

WHY THIS BEARING CONSTRUCTION INSURES LONG-TIME SERVICE . . .

IN THESE new G-E instruments, the pivots are solidly mounted on the *inside* of the armature shell instead of being cemented to the outside of the armature winding. The result is a rigid construction that helps to maintain accurate alignment.

The steel pivots, highly polished, are of the aircraft type, larger than normal. This means less stress on the bearing surfaces and a construction that will stand rough treatment and shock.

The pivots rotate in low-friction, highly polished, glass vee jewels—one mounted rigidly in the top of the frame-and-core assembly, and the other mounted in a movable lower jewel sleeve located in the soft-iron core.

This combination—accurately formed, hard-glass jewels and large-radius steel pivots—provides a co-ordinated bearing that has proved, by field tests, to be excellent from the standpoint of long life and ability to withstand vibration.

Thin, Strong, Accurate Instruments

1. *Thinness* is obtained by solidly mounting the pivots on the inside of the armature shell. Most instruments are approximately one inch deep.
2. *Strength* is obtained by short, solidly mounted, large-radius pivots and the extra-strong over-all case.
3. *Sustained Accuracy* is insured by the featherweight moving element, combined with high torque and permanent alignment of all parts.

For ratings, prices, and dimensions, ask our nearest office for Bulletin GEA-4064, which covers instruments for use in radio and communications equipment; or Bulletin GEA-4117, which describes those suitable for naval aircraft. *General Electric Co., Schenectady, N. Y.*

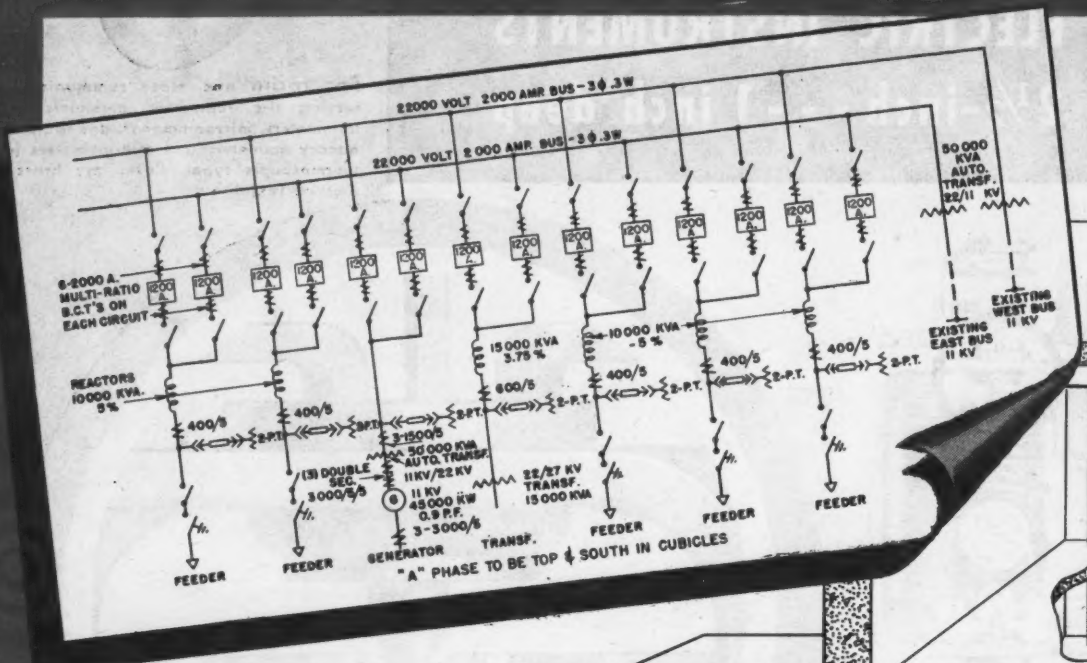
D-c voltmeters, volt-ammeters and ammeters are specially designed to measure voltage and current in battery and battery-charging circuits on naval aircraft. They meet applicable Navy specifications.

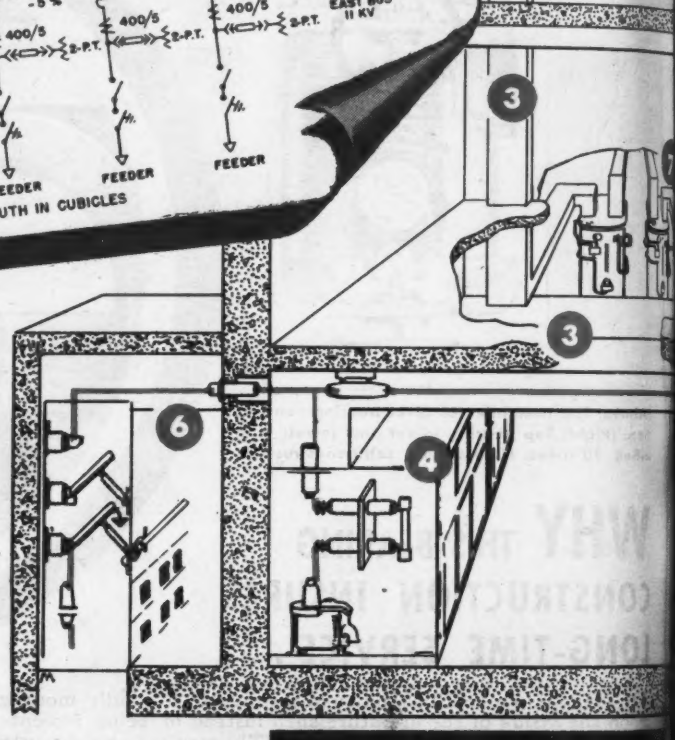
GENERAL ELECTRIC

602-44-6200

SMALL PANEL INSTRUMENTS

LOOK FORWARD TO THIS


22000 VOLT 2000 AMP BUS - 3φ 3W
22000 VOLT 2000 AMP BUS - 3φ 3W
50 000 KVA AUTO. TRANSF. 22/11 KV
6-2000 A. MULTI-RATIO B.C.T'S ON EACH CIRCUIT
REACTORS 10000 KVA. 5%
15 000 KVA 3.75 %
10 000 KVA - 5 %
EXISTING EAST BUS 11 KV
EXISTING WEST BUS 11 KV
400/5
800/5
3-1500/5
50 000 KVA AUTO. TRANSF. 11KV/22 KV
(3) DOUBLE SEC. 3000/5/5
11 KV 45 000 KW 0.9 P.F.
3-3000/5
22/27 KV TRANSF. 15 000 KVA
FEEDER
GENERATOR
TRANSF.
"A" PHASE TO BE TOP & SOUTH IN CUBICLES



How over-all planning solved a space problem, and made real savings

THIS is an actual installation in New England that was made when an additional generator was put into service.

Because of the building's design, the generator and transformers could be located only in certain places. The remaining space was insufficient for open-type, or masonry cell, switchgear.

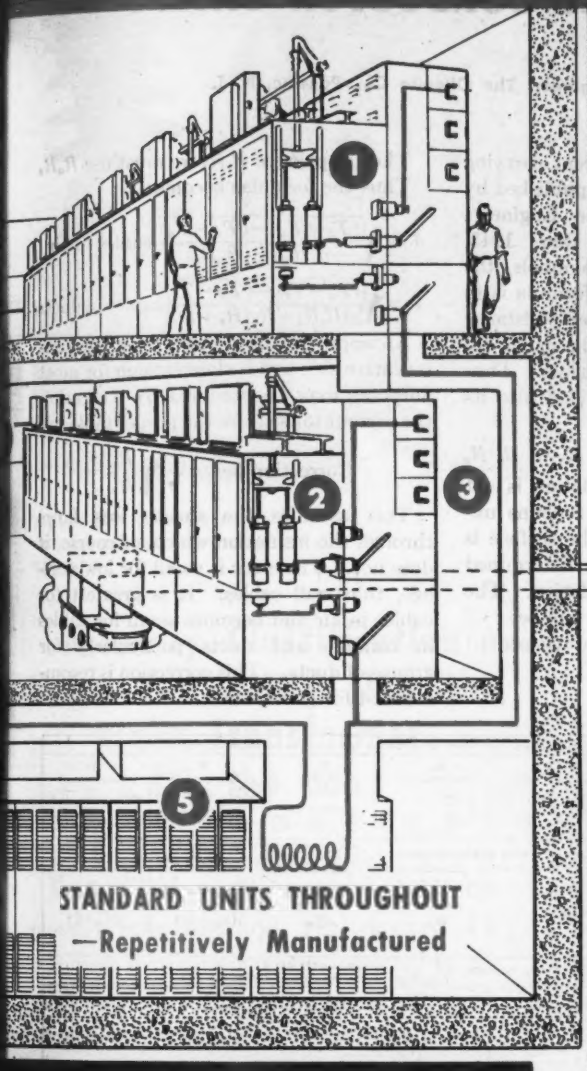
By studying the switching requirements of the entire system, the utility's engineers, working with G-E engineers, planned this layout. It provides for all the functional requirements and, at the same time, makes the best possible use of the available space. Because of the inherent co-ordination in G-E metal-enclosed equipments, the company was able to obtain a high degree of efficiency in the over-all system operation.

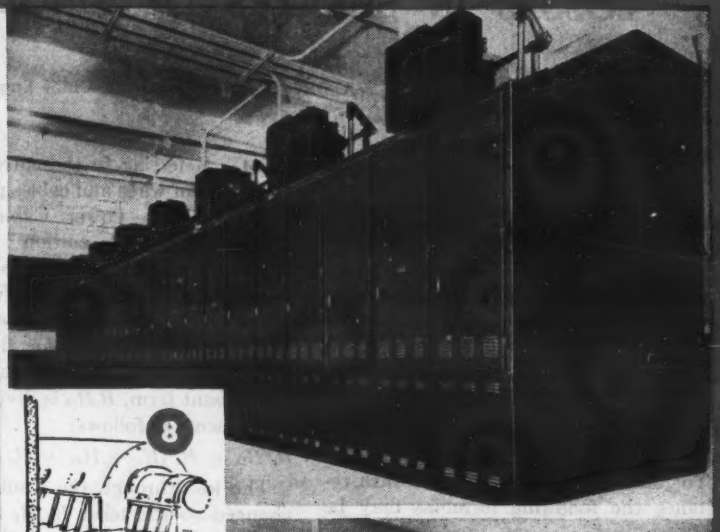
Thus, if you want complete co-ordination, install this type of equipment throughout. Electrical, mechanical, and thermal co-ordination, within and between equipments, is assured by factory assembly and testing. This fact permits a wide range of flexibility as to location, and assures you that the entire installation can function as one piece of equipment.

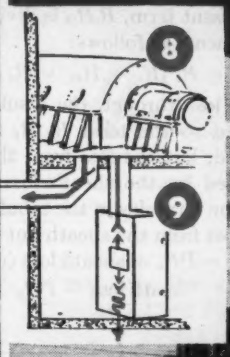
The completeness, compactness, and ease of installation of G-E metal-enclosed switchgear equipments make them the logical answer to your switchgear problems. Ask your G-E representative for a copy of Bulletin GEA-3742. *General Electric Company, Schenectady 5, N. Y.*

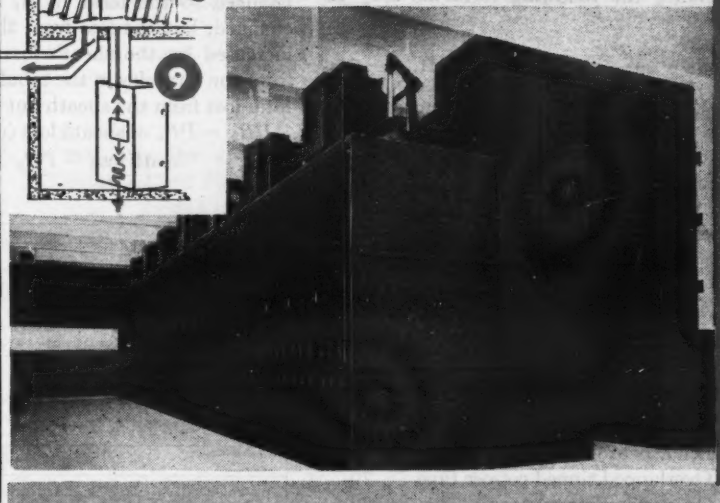
Buy all the BONDS you can—AND KEEP ALL YOU BUY

TYPE OF SWITCHGEAR









1. FH cubicles on 3rd floor
2. FH cubicles on 2nd floor
3. Interconnecting bus runs
4. Drawout potential-transformer compartments
5. Feeder-reactor compartments
6. Cable-entrance compartments
7. Autotransformers—10,000 kva
8. Turbine-generator
9. Neutral reactor compartment

PACKAGED SWITCHGEAR

GENERAL ELECTRIC

855-16-7300

HOW TO CALCULATE VOLTAGES, CURRENTS AND LOSSES IN SHEATHS OF SINGLE-CONDUCTOR CABLES

By RICHARD C. WALDRON, Assistant to the Chief Engineer, The Okonite Co., Passaic, N. J.

The tabulation gives the formulas for calculating the induced voltage and sheath loss for single-conductor cables. These formulas neglect proximity loss but are accurate enough for practical purposes.

It is assumed that the cables are carrying balanced currents.

For cables installed three per conduit use case II. The spacing S in this case will be equal to the outside diameter of the cable increased by 20 percent to allow for random spacing in the conduit.

To facilitate calculating the sheath resistance the following formulas may be used:

$R_s = \frac{\rho'}{8 r_m t}$ micro-ohms per ft.

R_s = resistance of sheath (micro-ohms per ft.)

t = thickness of sheath or metal tapes used for shielding (inches) or diameter of wires used for wire armor or braid (inches)

ρ' = apparent resistivity of sheath or shield in ohms/cir. mil ft. at operating temperature (assumed 50° C.) This includes allowance for the spiraling of the tapes or wires

	ρ'
Lead sheath	150
Overlapped tinned copper tape	70
Operlapped monel tape	2500
Interlocked copper tape	50
Interlocked bronze tape	85
Braided copper wires	80
Layer of strands—copper wires	17
Layer of strands—steel wires	125

The permissible current carrying capacities of cables may be calculated taking into account the sheath loss thus allowing operating with sheaths solidly bonded and grounded at more than one point. Referring to the current carrying capacities of wires and cables published by The Insulated Power Cable Engineers Association (first edition Dec. 1943, page 50) for formulas and symbols, the only change required in the formula is to correct the product of copper resistance and thermal resistance for the extra apparent resistance due to sheath loss. Thus the present term, $R_c R_{th}$ is divided into its components as follows:

$$R_c R_{th} = R_c (R_i + R_s) = R_c R_i + R_c R_s$$

The loss through the insulation is not changed so the term $R_c R_i$ remains unchanged, but the loss from the surface is increased by the sheath loss determined from the formulas in the tabulation. The total loss from the sheath out will be:

$$I^2 R_c = I^2 R_c + \text{sheath loss (watts per ft.)}$$

$$R_s = \frac{\text{Sheath loss} + I^2 R_c}{I^2}$$

Then in place of $R_c R_s$ we must use $R_s R_s$. Thus the formulas become:

$$I = \sqrt{\frac{(T_c - T_a) - (T_d - T_a)}{n(R_c R_i - R_s R_s)}}$$ cables in air

$$I = \sqrt{\frac{(T_c - T_a) - (T_d - T_a)}{n[R_c R_i + R_s (R_s + D)]}}$$ cables in ducts

An approximation which is on the conservative side and is close enough for most purposes may be obtained by correcting the current taken from the proper table by:

$$\text{Correction factor} = \sqrt{\frac{R_s}{R_c}}$$

This assumes the sheath loss flows through the insulation which, of course, it does not. The error is small for low voltage, thin wall cables. It is greatest for cables in air and becomes small for cables in conduit and ducts particularly for groups of ducts. This correction is recommended for general use.

Formulas for sheath voltages-currents and losses for single-conductor cables

Cable Arrangement Number and Diagram	I One phase	II Equilateral	III Rectangular	IV Flat	V Two circuit	VI Two circuit
Induced sheath voltage-Sheaths open circuited (micro volts to neutral per ft. (multiply by 10^{-6} to obtain volts per ft.)						
Cable-A, Cable-C	IX_M	IX_M	$\frac{1}{2}\sqrt{3Y^2+(X_M-\frac{A}{2})^2}$	$\frac{1}{2}\sqrt{3Y^2+(X_M-A)^2}$	$\frac{1}{2}\sqrt{3Y^2+(X_M-\frac{B}{2})^2}$	$\frac{1}{2}\sqrt{3Y^2+(X_M-\frac{B}{2})^2}$
Cable-B	IX_M	IX_M	IX_M	IX_M	$I(X_M+\frac{A}{2})$	$I(X_M+\frac{A}{2})$
Sheath loss-Sheaths solidly bonded (micro watts per ft. (multiply by 10^{-6} to obtain watts per ft.)						
Cable-A, Cable-C	$I^2R_S\frac{X_M^2}{R_S^2+X_M^2}$	$I^2R_S\frac{X_M^2}{R_S^2+X_M^2}$	$I^2R_S\frac{(P^2+3Q^2)+2\sqrt{3}(P-Q)+4}{4(P^2+1)(Q^2+1)}$			
Cable-B	$I^2R_S\frac{X_M^2}{R_S^2+X_M^2}$	$I^2R_S\frac{X_M^2}{R_S^2+X_M^2}$	$I^2R_S\frac{1}{Q^2+1}$			
Total loss	$2I^2R_S\frac{X_M^2}{R_S^2+X_M^2}$	$3I^2R_S\frac{X_M^2}{R_S^2+X_M^2}$	$3I^2R_S\frac{P^2+Q^2+2}{2(P^2+1)(Q^2+1)}$			
	$P=\frac{R_S}{Y}$ $Y=$		$X_M+\frac{A}{2}$ / $X_M-\frac{A}{6}$	X_M+A / $X_M-\frac{A}{3}$	$X_M+A+\frac{B}{2}$ / $X_M+\frac{A}{3}-\frac{B}{6}$	$X_M+A-\frac{B}{2}$ / $X_M+\frac{A}{3}-\frac{B}{6}$
	$Q=\frac{R_S}{Z}$ $Z=$					

$X_M = 2\pi f(0.1404 \log_{10}\frac{S}{r_m})$ micro-ohms per ft. f = 60 cycles $X_M = 52.92 \log_{10}\frac{S}{r_m}$ micro-ohms per ft.

$A = 2\pi f(0.1404 \log_{10} 2^2)$ micro-ohms per ft. A = 15.93 micro-ohms per ft.

$B = 2\pi f(0.1404 \log_{10} 3^2)$ micro-ohms per ft. B = 36.99 micro-ohms per ft.

I = conductor current (amperes)
R_s = equivalent conductor resistance (ohms per ft.)
R_c = effective a-c resistance of the conductor including skin effect (ohms per ft.)
T_c = max. allowable copper temperature (deg. C.)
T_a = Base ambient air temperature (deg. C.)
T_d = copper temperature due to dielectric loss alone (deg. C.)
T_e = base ambient earth temperature (deg. C.)
R_i = thermal resistance of insulation per ft. of cable (thermal ohms)
R_s = surface thermal resistance per ft. of cable (thermal ohms)
n = number of conductors in cable
D = duct correction factor
f = frequency
S = spacing between center of cables (inches)
r_m = mean radius of sheath or shield (inches)

Concluding article in series which began in the ELECTRICAL WORLD September 30, 1944, page 95.

Why IS THE ACCURACY CLASSIFICATION OF THIS INSTRUMENT TRANSFORMER IMPORTANT TO YOU?

Type E-236 potential transformer, 24,000 volts, for accurate metering service and relay operation

Here's the Accuracy:

ASA Burden	W	X	Y	Z
ASA Accuracy Class	0.3	0.3	0.3	0.3

This means that with standard ASA burdens the ratio correction factor and the transformer correction factor will be within the limits of the ASA accuracy class 0.3.

NEMA Burden	W	X	Y	Z
NEMA Accuracy Class	¼	¼	¼	¼

This means that with standard NEMA burdens the ratio error and the phase angle will be within the limits of the NEMA ¼ accuracy class.

Accuracy Classification Helps You KNOW It's the Right Transformer for the Job

THE new ASA system of accuracy classification has made possible the most precise method yet devised for selecting instrument transformers. It enables you to select the most suitable transformer for the job to be done.

For example, different applications often require different transformer characteristics. A current transformer that is satisfactory for metering purposes (highest accuracy up to 100 per cent of its current rating) may not be satisfactory for relaying purposes where the *over-current* characteristics (currents as high as 20 times normal) must be considered.

All G-E instrument transformers are classified in accordance with the new ASA system of accuracy classification. A thorough knowledge of this system will help you in the selection of transformers for your particular application. *General Electric Company, Schenectady 5, N. Y.*

Buy Bonds — *and keep all you buy*

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

FOR A BETTER UNDERSTANDING OF ACCURACY CLASSIFICATION

This publication explains the ASA accuracy standards for current and potential transformers and shows how they differ from the NEMA standards. Also, you will find this booklet a handy guide to the selection of G-E instrument transformers. Ask for Bulletin GEA-4240. Address the nearest G-E office.

GENERAL ELECTRIC

604-14-6400

Here's something commercial lighting

READY FOR IMMEDIATE ACTION NOW! Everybody is agreed that the postwar store lighting market will be tremendous. And 'most everybody has plans for developing it . . . plans that call for manpower and materials that won't be available until war's end.

The General Electric Lamp Department's "nest egg" plan is something you can do *now* to sell better postwar store lighting. It's a practical plan you can start immediately. You can do it with your present manpower. And it will pay handsome dividends at the earliest possible moment. Read how it works!

1 SELECT YOUR NEST EGGS. Find a good prospect for modernized lighting in each neighborhood in your territory . . . explain to the owner how better lighting will attract more customers and build sales . . . and show him how his can be one of the *first* stores in that neighborhood to be relighted.

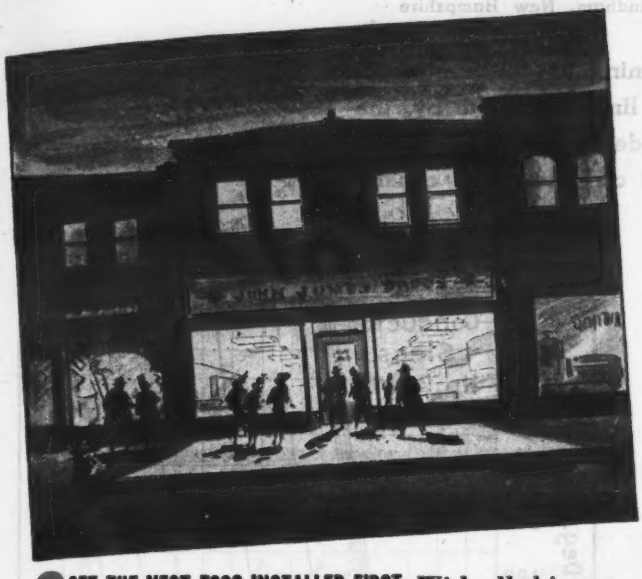
2 ORDER THE MATERIALS NOW. Bring a contractor and supplier in on the job . . . make a layout for the store's general lighting, and showcase, display and decorative lighting, both incandescent and fluorescent. Place orders for the fixtures, lamps and all other materials NOW, for delivery as soon as available.

Hear the General Electric radio programs: "The G-E All-Girl Orchestra", Sunday 10 p. m. EWT, NBC; "The World Today" news, every weekday 6:45 p. m. EWT, CBS.

GENERAL ELECTRIC

you can do NOW about

Facts About General Electric's "Nest Egg" Plan For Selling Better Store Lighting



3 GET THE NEST EGGS INSTALLED FIRST. With all this preliminary work done, you can see to it that these stores are among the first in their neighborhoods to be relighted... shining examples of good lighting... "nest eggs" that will make other stores in the same neighborhoods want good lighting jobs.

5 Recent General Electric Lamp Department surveys show the great majority of storeowners plan to relight. Look at the answers to these questions!

Will you purchase Fluorescent when it becomes available?

Yes: 65.9% Undecided: 16.1% No: 18.0%

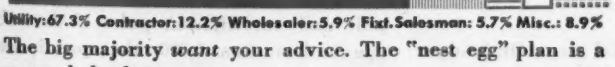
Two-thirds of the storeowners interviewed are planning to relight with fluorescent. They'll buy better all-round lighting if "nest eggs" lead the way.

What type of Fluorescent Lighting Equipment will you purchase?

Shielded Lamps: 14.5% Exposed Lamps: 28.4% Latest Type: 8.1% Don't Know: 49.0%

Half the 1276 storeowners surveyed didn't know what kind of equipment they will buy. "Nest eggs" will help them decide.

To whom will you go for advice?



Utility: 67.3% Contractor: 12.2% Wholesaler: 5.9% Fixt. Salesman: 5.7% Misc.: 8.9%

The big majority *want* your advice. The "nest egg" plan is a way to help them.

4 NEST EGGS ARE EASY TO SELL. Today, your neighborhood "nest eggs" are easier to sell than ever before. Store owners want better lighting... and G-E Lamp advertising is showing it to them... with full-page ads in more than 20 publications covering 15 different types of commercial establishments.

Some utilities already have started work on the "nest egg" plan. Shouldn't you consider it for the shopping areas in your territory?

"TO MAKE G-E LAMPS STAY BRIGHTER LONGER"
The Constant Aim of G-E LAMP RESEARCH

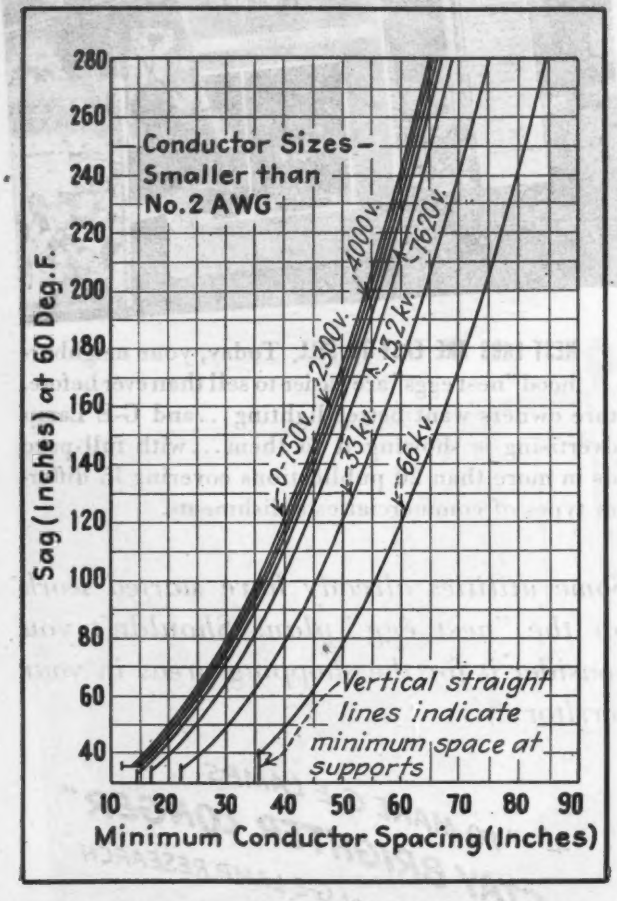
BUY MORE WAR BONDS—AND HOLD 'EM

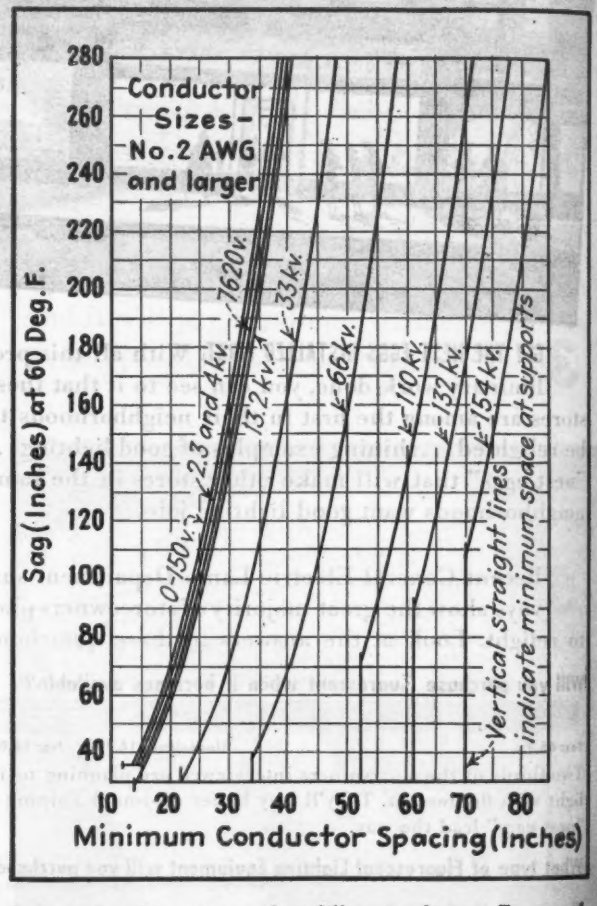
G-E MAZDA LAMPS

CODE REQUIREMENTS FOR MINIMUM WIRE SPACING

By PHILIP MORRILL, Windham, New Hampshire

These curves represent the minimum horizontal spacings of conductors on overhead lines, allowed by the 1940 National Electrical Safety Code. In standard practice the values shown on the curves are increased considerably





Minimum horizontal code separation (1940 code) for overhead line conductors of various sizes and at different voltages. For use of suspension insulators add to the separation in inches a distance of 0.707 L, where L is the length (inches) of the insulator string. Curves are based on the following formulas:

For Fig. 1—Separation (inches) = 0.3 kv. + 7 $\sqrt{(sag/3)} - 8$ **For Fig. 2—Separation (inches) = 0.3 kv. + 8 $\sqrt{sag/12}$**

In both of the formulas sag is in inches.

When running a pole line, it is desirable occasionally to have some spans considerably longer than the ruling span of the line. In such a case these curves are valuable, to check the spacing on the long spans so as to determine whether standard construction can be used or whether special construction must be used to increase the spacing.

The code allows decreasing the above spacing in a few special cases. On bridges and for bare or TBWP conductors of circuits up to 8,700 volts, a 6-in. spacing may be employed on spans not over 20 ft., and for circuits up to 8,700 volts a 9-in. spacing on spans not over 50 ft. On buckarm poles to allow climbing space, conductor spacing can be reduced to half the pin space (7¼ in.) on one pole and not adjacent poles if the voltage is less than 8,700, the span is less than 150 ft. and the sag is not over 15 in. on No. 2 AWG wires and not over 30 in. on wires smaller than No. 2 AWG. In actual practice lines should not be built to these minimum spacings except for one or two (not adjacent) spans where cost may be kept down due to special circumstances.

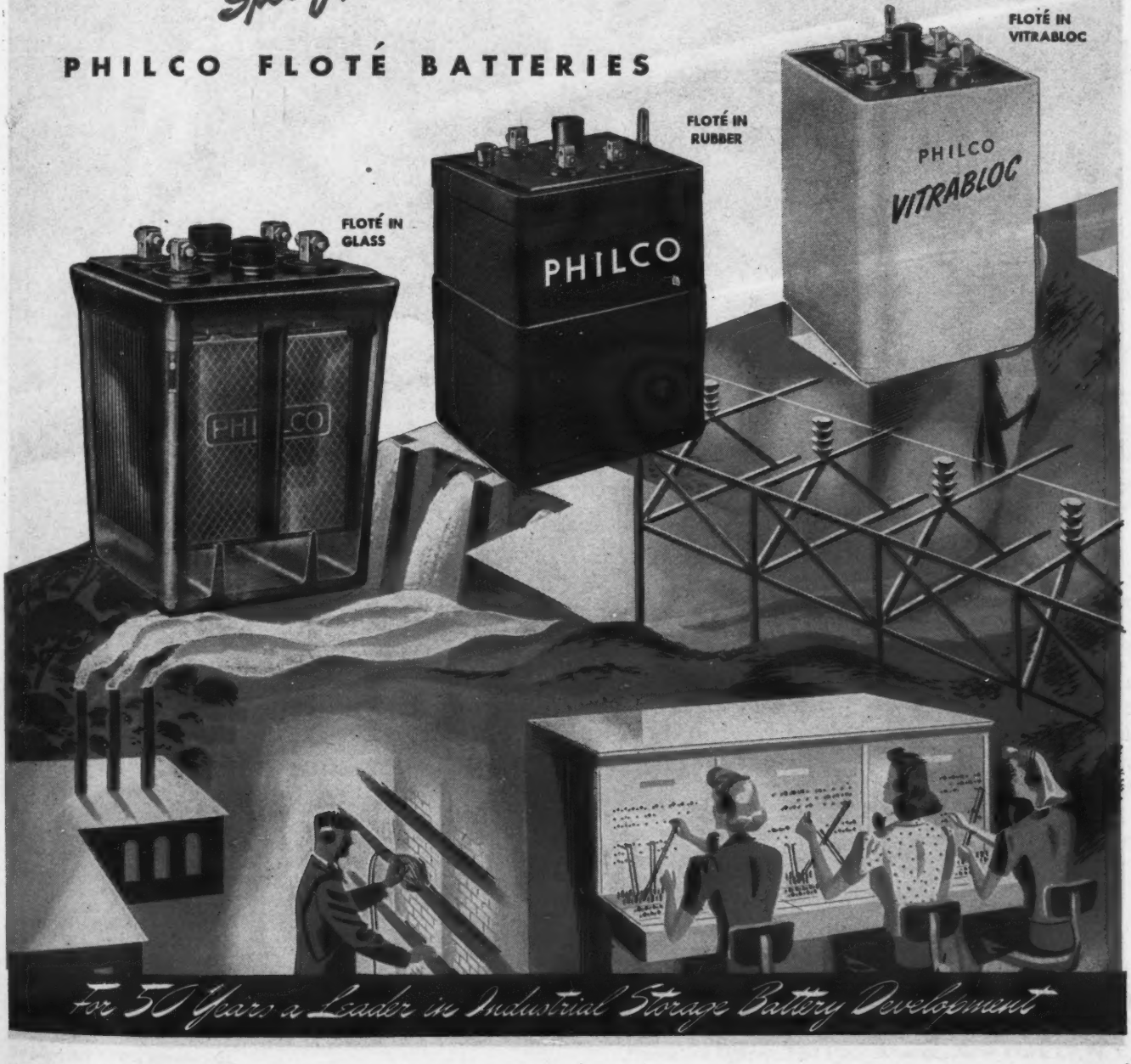
MODERN CONTROL BATTERY ENGINEERING IS A PROCESSION OF PHILCO *"Firsts"*

The development which brought modern full float battery service to the Public Utilities in a really big way, was the famous Philco Floté grid. With a new, more efficient structural arrangement cast in a more efficient metal, it gave utility engineers the first and only battery specifically designed for full float service. It provided high capacity and long life. It eliminated low cells. Its low internal loss reduced maintenance and charging costs. Originally introduced by Philco and still fabricated in steel glass jars—this modern Philco Floté battery construction today is available in the space-saving Philco Vitrabloc and Philco rubber, and in a range of capacities and sizes for all types of control and standby service. Write for latest catalogs.

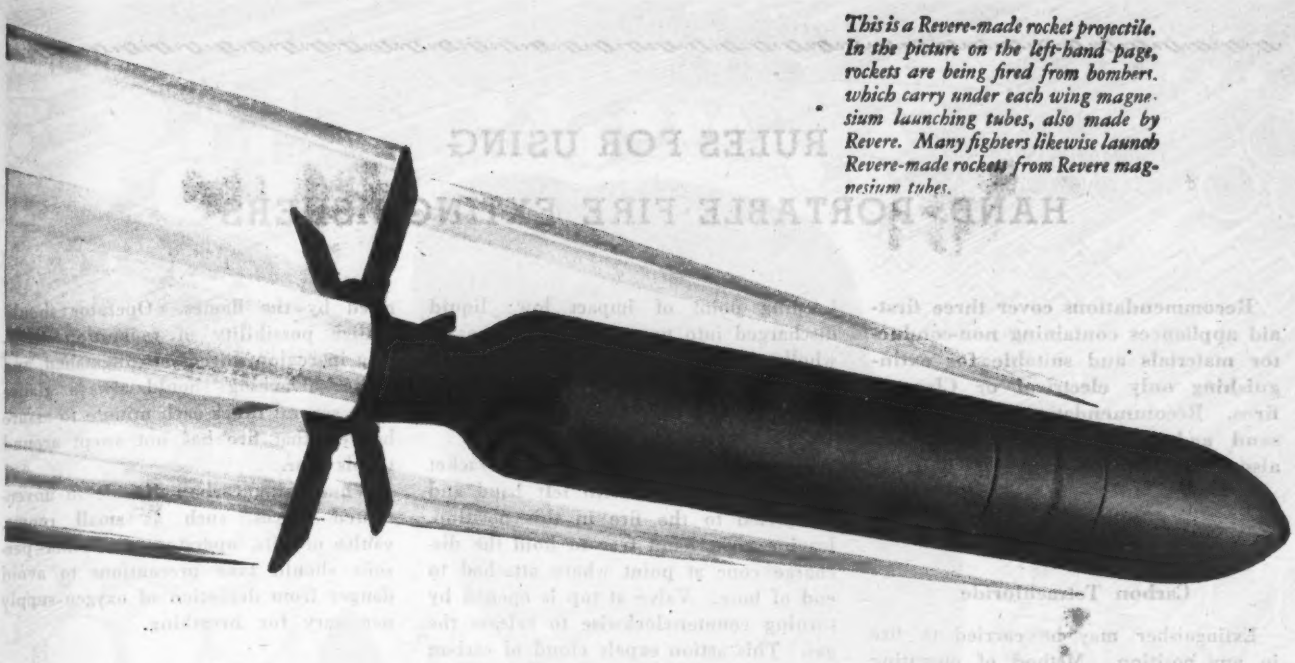
PHILCO CORPORATION
Storage Battery Division, Trenton 7, New Jersey
Makers of the Famous Philco "Thirty"

Specify

PHILCO FLOTÉ BATTERIES



For 50 Years a Leader in Industrial Storage Battery Development



This is a Revere-made rocket projectile. In the picture on the left-hand page, rockets are being fired from bombers, which carry under each wing magnesium launching tubes, also made by Revere. Many fighters likewise launch Revere-made rockets from Revere magnesium tubes.

It's GOT to be PERFECT!

Revere has made over two million rocket projectiles out of Revere Electric Welded Steel Tube

Look at that rocket projectile streaking through the air faster than the airplane flies!

Think of the terrific heat and pressure required to propel that rocket with such amazing speed and accuracy!

And then remember this:—Revere not only developed those projectiles at Army Ordnance request, but has made over two million rocket projectiles and rocket targets out of Revere Electric Welded Steel Tube.

Any steel tube suitable for such a purpose must be not merely good, but PERFECT. It must pass a pressure test of over 5000 pounds per square inch!

What this means to YOU

It will be great good news to you that today our facilities are so large that we are once again able to fill commercial orders, on a priority basis only.

If you need steel tube for boilers, condensers, water and steam lines, or for general pressure or mechanical applications, consult Revere. We will not only supply high-pressure electric welded steel tube, but will cooperate with you in working out any problems in specifications, selection or installation. Revere has been welding steel tube electrically for 25 years. We *know how*.

May we work with you *now* in formulating your plans for the use of steel tube?

Rocket Projectile Facts

Propelling charge is a special powder producing great heat and pressure as it burns.

High-explosive head contains pentolite, 20% more powerful than TNT.

Projectile has the devastating effect of a 105-mm. shell.

Unlike a shell, a rocket is fired without recoil, and hence can be discharged from a plane, from ships too small to carry artillery, or from light launching apparatus used by ground troops.

Rocket projectiles are used to destroy fortifications, tanks, planes, ships, submarines, and against enemy troops, in France, Italy, Russia, and the Pacific.

They are probably the most effective of projectiles per pound and per dollar.

Thus the war comes rocketing to an earlier end!

Picture at left reproduced from original by Robert Lindgren, Art Editor, AIR NEWS, September issue.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Avenue, New York 17, N.Y.

RULES FOR USING
HAND-PORTABLE FIRE EXTINGUISHERS*

Recommendations cover three first-aid appliances containing non-conductor materials and suitable for extinguishing only electrical or Class C fires. Recommendations for use of sand and soda-sawdust mixture are also stated.

•

Carbon Tetrachloride

Extinguisher may be carried to fire in any position. Method of operating depends on design of pump mechanism and is fully described in nameplate instructions. Liquid expelled is vaporized into gas by heat of the fire, partly in the stream and remainder after falling on or near the burning material. While usually most effective if used close to fire, in case of necessity the stream can be directed from a distance approximately 20 to 30 ft. horizontally, varying for different types and methods of operation.

Extinguishers operating on stored air-pressure principle are brought into play by opening discharge valve manually and manipulating hose nozzle to produce same action as described for hand-pump type.

On all fires the stream should be directed at base of flames. For flammable liquid fires, best results are obtained when discharge from extinguishers is played against interior wall of the container or against any nearby vertical surface if fire is unconfined. In either case, stream should be broken up or deflected near the burning surface; it should *not* be directed *into* the liquid. Where possible, operator should walk around the fire while directing the stream, so as to get maximum coverage during the discharge period.

On fires involving solid materials, extinguisher should be used in such manner as to form a layer of smothering gas over and around seat of the flames. Effectiveness is limited to small fires only, and best procedure is to work from same side as any approaching air currents, keeping point of impact low; liquid discharged into upper part of flames is wholly ineffective.

Carbon Dioxide

Extinguisher is removed from bracket by grasping handle with left hand and is carried to the fire in this position, leaving right hand free to hold the discharge cone at point where attached to end of hose. Valve at top is opened by turning counter-clockwise to release the gas. This action expels cloud of carbon dioxide gas with some snow through the cone; discharge has effective range approximately 6 to 8 ft.

A smaller carbon dioxide unit recently introduced has 2-lb. capacity and is operated with one hand. Underwriters' classification is B-4 for flammable liquid fires; unit is useful also for small Class C (electrical) and D (automobile) fires. Weight is carried by pistol-grip handle and trigger release is manipulated by index finger, after breaking safety seal wire which prevents tampering or accidental discharge.

On all fires, discharge should be directed at base of flames, and should continue over the burned surface even after flames are extinguished, to deposit snow and thus tend to prevent possible re-ignition.

On flammable liquid fires, best results are obtained when stream from extinguisher is used to sweep the flame off the burning surface, starting at near edge of fire and progressing forward, while moving the discharge cone very slowly from side to side.

Carbon dioxide is effective on flammable liquid fires under conditions which allow gas to be employed in such manner as to separate flames from the burning surface. It is likewise effective on electrical apparatus and automotive equipment. It is unsuitable for deep-seated fires of ordinary materials such as wood, paper, rubbish, but may be of value for surface fires in small quantities of such material where smothering effect of the gas is sufficient.

In all cases, fire should be attacked from the windward side if possible, so that drift will carry the gas blanket into the burning area and across any of the exposed combustible beyond, not yet ignited by the flames. Operator should realize possibility of re-ignition occurring in region initially extinguished, and while advancing should always glance back several times each minute to assure himself that fire has not swept around to his rear.

When using carbon dioxide in unventilated places, such as small rooms, vaults or pits, operators and other persons should take precautions to avoid danger from depletion of oxygen supply necessary for breathing.

Dry Compound

(*Powder Expelled by Carbon Dioxide*)

Extinguisher is removed from bracket by grasping handle with left hand and is carried to the fire in this position. Valve at top is opened by turning counter-clockwise to release the gas. This action expels a cloud of chemical and gas through the hose nozzle, with an effective range 6 to 12 ft. horizontally. Extinguisher should be kept upright.

On flammable liquid fires, best results are obtained when stream from extinguisher is used to sweep the flame off the burning surface, starting at near edge of fire and progressing forward while moving the discharge cone very slowly from side to side. Stream should *not* be directed *into* the burning liquid.

When moving to a new position in fighting the fire, discharge can be shut off temporarily by releasing spring-type valve at nozzle. However, this does not retain gas pressure longer than a few minutes, and dependence should therefore not be placed on availability of extinguisher contents long after initial use.

Sand, and Soda-Sawdust Mixture

Pails of sand should be carried to the fire and contents thrown or poured over entire surface of the burning material, using the scoop as needed. Sand or mixture can be applied effectively only at short range from the fire. Sand may also be used for making low dikes to prevent spread of flammable liquid puddles.

Soda-sawdust mixture is applied by shoveling from storage bin and distributing over entire surface of burning oil or grease, as it does not spread of its own accord.

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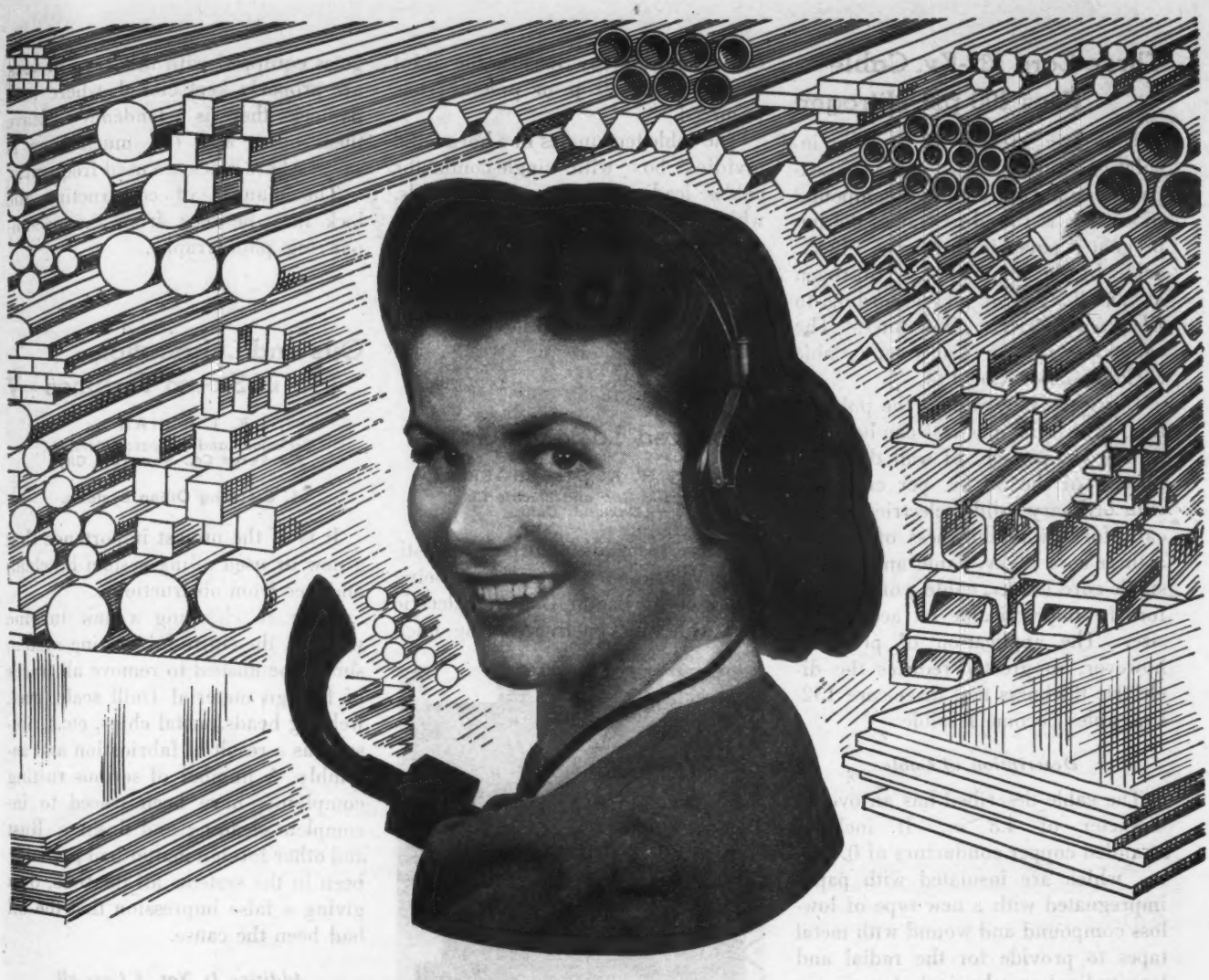
* Adapted from "Handbook of Fire-Safety Practices for Public Utility Property," Ebasco Services Incorporated, New York, N. Y. This series began in ELECTRICAL WORLD, September 2, page 100.



Call Ryerson When You Need Steel

Every type of steel from stainless to structurals is immediately available from Ryerson stock. Just reach for the phone and call any one of the eleven conveniently-located Ryerson service plants. Our operators will connect you at once with an experienced service man who will see that you get the steel you need—when you need it.

JOSEPH T. RYERSON & SON, INC.
Steel Service Plants: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.

QUICK, DEPENDABLE SHIPMENT

Three-Core 132-Kv. Cable Uses 200 psi. Nitrogen

Dielectric strength of voids in insulation, which follow the thermal expansion and contraction of compound in service, is raised to that of the impregnated paper in three-core 132-kv. cable by the application of nitrogen at 200 lb. per sq. in., according to *Electrical Review* (London). The cable was laid by Callender's Cable & Construction Co., Ltd.

In this way, continues the publication, the maximum stress can be taken as 100 kv. per cm. of wall thickness instead of the 50 kv. per cm. used with ordinary solid dielectrics, which calls for a wall thickness of 0.6 in., a three-core 66-kv. cable and even a single-core 132-kv. cable would therefore be impracticable on account of size. The application of pressure, however, so greatly reduces the dielectric thickness that three-core 132-kv. cables become feasible.

Description of Cable

The cable described has an overall diameter of 4.8 in. It includes stranded copper conductors of 0.4 sq. in., which are insulated with paper impregnated with a new type of low-loss compound and wound with metal tapes to provide for the radial and longitudinal mechanical forces exerted by the gas pressure between dielectric and lead sheath. A rubber-bitumen sandwich serving prevents corrosion of the reinforcement.

Joints are built-up with paper tape and preformed paper rolls enclosed (without compound filling) in a lead sleeve, which is in turn enclosed in a copper reinforcing sleeve, the whole being surrounded by standard pitch-filled concrete box. Dimensions of dielectric in the joint are controlled in accordance with the intensity of the electric field at every point and an earth screen is placed immediately over the dielectric. The space between the dielectric and joint sleeve provides the gas path between adjacent lengths of cable.

Nitrogen is introduced into the cable at one end of the route. Should the internal pressure fall, a switch in the joint box places a resistance across the two-core pilot cable embodied in the main cable and an automatic Wheatstone bridge at the end of the feeder is brought into action. This measures the resistance of the pilot cable and thereby locates the joint in which the drop in pressure has occurred.

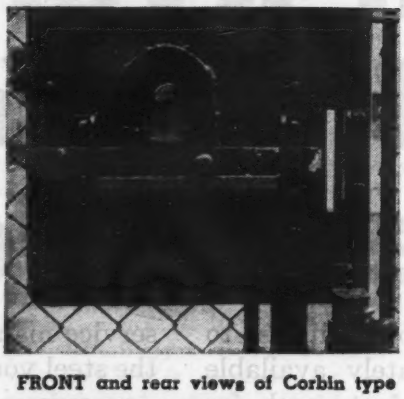
The cable terminates in a horizontal dividing box with single-conductor cables leading to the sealing ends, which are insulated from their supporting structure and earthed at the dividing-box position so as to prevent the introduction of circulating currents in the sheathing and reinforcement.

•

Improved Lock for Gates

By H. A. DILBERGER
Pacific Gas and Electric Co.
Oakland, Calif.

Where the additional cost is justified, padlocks for wire gates are being displaced by Pacific Gas and Electric Co., with quick acting, spring latch



FRONT and rear views of Corbin type lock for substation gates which is safer, easier and quicker to operate than the displaced padlock

locks. The new type illustrated has several advantages: (1) it eliminates the swinging bars formerly used which have been responsible for many head, foot and finger injuries; (2) gates may be operated with one hand as readily as a standard door; (3) gates equipped with this type of lock are properly kept closed, where with padlocks there is a tendency to leave them open, and (4) much time is saved where gates are used frequently.

The manner of constructing the lock may be seen from the accompanying photographs.

•

Oils and Lubrication of Steam Turbines—V

R. J. RONAN*
Technical and Research Division
The Texas Co., New York City

5. Cleaning Oiling Systems.

It is of the utmost importance that a new or used oiling system be clean and free from obstructions.

Prior to charging a new turbine with oil, the entire lubricating system should be flushed to remove all traces of foreign material (mill scale, rust, welding beads, metal chips, etc.) present, as a result of fabrication and assembly. A number of serious rusting complaints have been traced to incomplete cleaning and flushing. Rust and other foreign matter had probably been in the systems all the time, thus giving a false impression that the oil had been the cause.

Additive Is Not A Cure-all

This applies equally to used systems. The performance of turbine oils in service depends to such a large extent on the condition of the lubricating system in which the oil is used that the necessity for having a turbine lubricating system in clean condition before adding a new charge of oil cannot be over-emphasized. Loose mineral matter such as rust and scale will cause clogging of lines, sticking of governors, scoring of journals and bearings: This material also will cause foaming, promote emulsification with water and catalytically accelerate oxidation. Other foreign materials such as certain rustproof compounds, pipe thread compounds, cutting oils, etc., will likewise contaminate the oil and adversely affect its service life. The elimination of such contaminants by the use of a proper turbine cleaning procedure will greatly reduce oil maintenance problems.

No combination of additives can act as a substitute for proper cleaning.

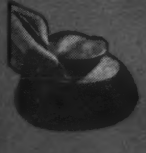
* This series began in the ELECTRICAL WORLD September 30, page 93.

5½ OUT OF 8

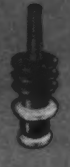
major design developments in electrical porcelain have been made by Westinghouse

FARADOID PRINCIPLE improved performance of high-voltage transmission lines. Surfaces were proportioned to conform to the equipotential surfaces of the electrostatic field. Now an industry-wide standard.

HIGH-STRENGTH SUSPENSION developed to meet demands of railroad electrification. Increased load limits of suspension insulators to 25,000 and 36,000 pounds. Made possible more improvements in power transmission.

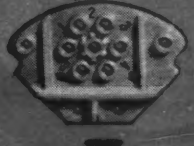


RADIO-INTERFERENCE-PROOF (RIP) INSULATORS, first introduced in 1930. Solved the radio reception problem caused by the usual arcing flow of capacity currents between conductor and insulator surfaces. Now an industry standard.



SOLDER SEALING is to this day the only effective means of producing a hermetic joint between metal and porcelain. Gives permanent protection to oil or air-insulated equipment against moisture or dirt.

BULLET-PROOF INSULATORS increased section thickness, and proportioned surfaces so as to always produce ricochet. Helped solve breakage due to stone throwing and target shooting.



PRESTITE is a revolutionary new porcelain, dense, nonporous with high dielectric and mechanical strength. Can be formed to intricate shapes with close tolerances.

LINE AND STATION POST INSULATORS...a co-development of Westinghouse and other engineers.

In the past quarter century, there have been 8 major porcelain improvements. Six of these have been exclusive Westinghouse developments . . . the seventh was a co-development.

For buyers of porcelain, this is a convincing guarantee that they can count on Westinghouse Insulators for leadership in design, research and manufacture.

The co-ordinated engineering which made possible these advances, is now at work on new projects. Feel free to co-ordinate these research facilities with your own porcelain problems and planning . . . and for porcelain backed by the BEST in *electrical* engineering.

Westinghouse maintains 120 stocking points to assure delivery anywhere in the United States. Westinghouse Electric & Manufacturing Company, P. O. Box 868, Pittsburgh 30, Pa. J-05154

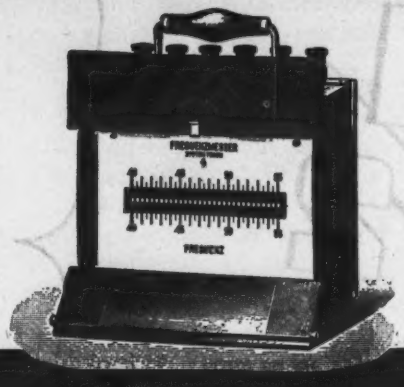
Westinghouse
PLANTS IN 25 CITIES... OFFICES EVERYWHERE

INSULATORS

"FRAHM" FREQUENCY METERS

. . . IN 1910

the wood engraving at the right appeared in our first bulletin on Frahm Resonance Frequency Meters.



AND TODAY . . .

the Frahm instruments shown below are typical of the thousands we build each year.

In the 34 years that have passed since Mr. James G. Biddle introduced Resonant Reed Frequency Meters to American industry, the basic principle of these instruments has not changed. Countless refinements and improvements have been made since that date, and the range of application is being constantly broadened. Frahm Resonant Reed Instruments were unique and outstanding in 1910. And today, through Biddle experience, research and development, the same simple resonant reed principle is being applied to the solution of an amazing number of measurement problems.

Write today for Bulletin 1695-W

James G. Biddle Co.

1211-13 ARCH STREET *Electrical and Scientific Instruments* PHILADELPHIA, PA.

flushing, and maintenance. This is a particularly important factor under present emergency conditions when severe schedules, overload operations, and scarcity of experienced operating personnel may result in poor maintenance practices which will greatly increase the rate of oil deterioration.

Nor can rust-inhibited oils prevent rust formation in parts of the turbine system with which they do not come in contact. Therefore, even with inhibited oils, some traces of rust may be found in certain portions of the lubricating system not regularly reached by the oils, such as sump and storage tank roofs unless these latter are treated with a rust preventive.

•

Old Standing Poles Given Longer Life

Simple but effective treatment of long standing untreated cedar and chestnut poles which are good enough to remain in service until the next inspection (usually three years later) are given the recommended application of the Bell System to lengthen their life. The preservatives (sodium fluoride and creosote) are applied to the ground line section of the poles to inhibit wood-destroying fungi.

As treated in a paper by C. H. Amadon in the July 1944 issue of *Bell*

IN GRASSLESS AREA the soil is saturated with a second application of creosote by filling a shallow trough

Laboratories Record, after excavating around the base of the pole to a depth of 12 to 15 in. the next step is to distribute one pound of sodium fluoride against and around the pole at the bottom of the excavation. Fill loosely with soil to ground level.

It's the Way They're Made!

That's Why L-M Lightning Arresters Provide Better Protection . . . Require Less Replacement . . . Lower Arrester Costs

The protection a lightning arrester will provide . . . the years over which it will handle light and heavy surges depend upon the way it is designed and built. . . . L-M Lightning Arresters are outstanding in this respect. Failures in the field are negligible. Their ability to stand up for years means less expense for you.

NO OTHER ARRESTER CONSTRUCTION LIKE THIS

ONE

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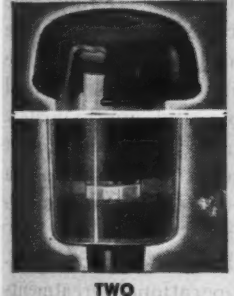

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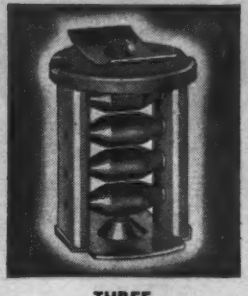

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3. This shows assembly of the ladder spark gap which is made of heavy brass bar—not stampings—machined to 7/16" diameter; the upper electrode; the synthetic rubber sealing gasket; and the copper cap which is spun to the housing under pressure. This entire assembly constitutes one compact moistureproof unit.

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AN EXCLUSIVE L-M FEATURE
PAT. NO. 2,315,320

MEETS THE NEW NEMA STANDARDS

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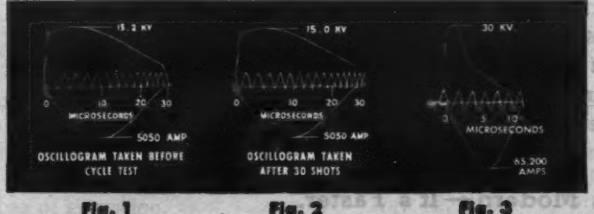

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LM

LINE MATERIAL
LIGHTNING ARRESTERS

L-M DISTRIBUTION EQUIPMENT INCLUDES: Distribution Transformers · Fuse Cutouts and Fuse Links · Lightning Arresters
Oil Switches · Pole Line Hardware · Line Construction Specialties · Underground Equipment · Fibre Conduit · Street Lighting Equipment

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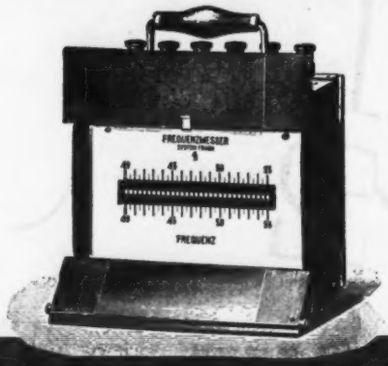

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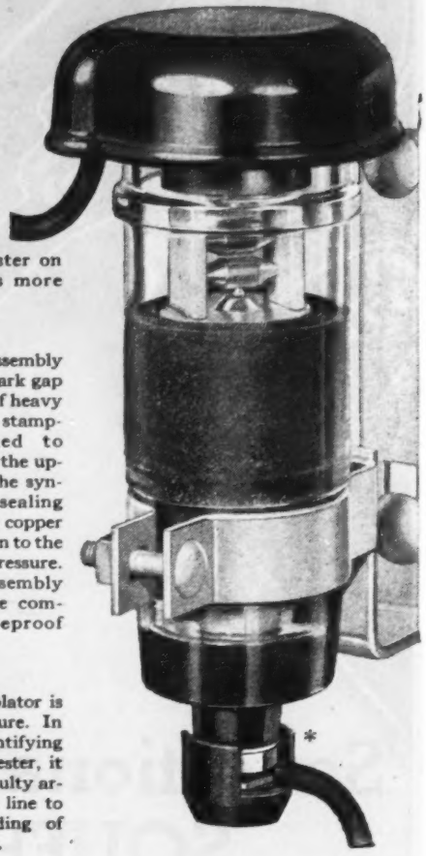

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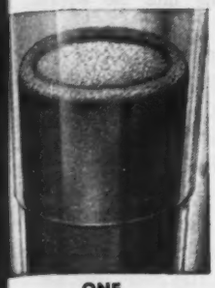

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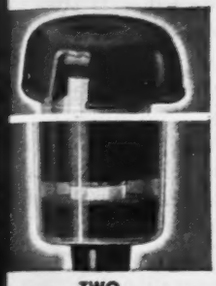

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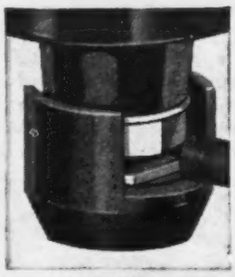

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C-O-TWO is listed by the Underwriters' Laboratories; fully approved by Factory Mutuals and the Bureau of Marine Inspection and Navigation. C-O-TWO is a registered trade mark. To be safe, specify C-O-TWO.

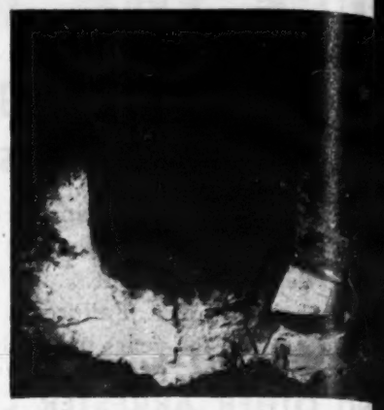
Sensational SQUEEZ-GRIP

This picture of the C-O-TWO Squeez-Grip valve gives a bare suggestion of the speed and simplicity of the modern use of carbon dioxide gas to extinguish fires. It shows how the gas is released by a mere pressure of closing your hand. There is no wheel to turn—that's the old slow gas wasting way. The extinguisher is carried by the valve handle—no waste motion—no need to set it down. The same hand squeezes the release lever which controls the discharge of gas, the other is free to direct the blast of sub-zero carbon dioxide to smother the fire in seconds. The speed of C-O-TWO Squeez-Grip release valve is sensational.

Squeez-Grip Saves Gas — Saves Time — Saves Lives — It's Modern — It's Faster.

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 NEW JERSEY
Sales and Service in the Principal Cities of United States and Canada
Affiliated with Pyrene Manufacturing Company

Then a 10-in. trough is formed around the pole by pressing the soil away with a shovel. Using a water-



SODIUM FLUORIDE is distributed against the pole into the excavation

ing can, with sprinkler head removed and tip of spout flattened to pour a fan-shaped stream, from one to one and a half gallons of creosote is poured around the pole at a height of about 18 in. Creosote should enter all large checks. After a short interval the creosote-saturated soil is pressed against the pole, and the backfilling is completed. If the pole stands where creosote would not be objectionable on the surface of the soil, another shallow trough is formed around the pole and approximately one-half gallon is poured against it as before. Where the pole stands in a park or grassed area, the final application is omitted.

Accumulated evidence from experimental and operational treatment

POURING CREOSOTE on pole by use of flat-spouted watering can

indicates that the sodium fluoride and creosote treatment effectively reduces the rate of deterioration of poles and that their service life, as far as ground-line condition is concerned, will be increased by about six years. Sodium fluoride and creosote are also both toxic to termites. This extension of pole life is alone considered sufficient to justify the costs involved, but an additional saving accrues from the

Free from the built-in hazards of ordinary insulation

LUMARITH* stays the BLACK HAND OF CORROSION

• Even under severe conditions of humidity and current load, Lumarith films thin enough for hairlike copper wire protect against corrosion.

• Open circuit coils especially require extra protection against electrolysis associated with moisture and leakage of current through insulation. Here Lumarith is ideal.

The best protection against electro-chemical corrosion is insulation that does not in itself promote decomposition when subjected to unfavorable conditions.

In electrical applications Lumarith is outstanding for chemical inertness. It does not combine with moisture to form free acids, nor is it subject to failure through oxidation. Even in direct current applications it protects against the usual sources of corrosion.

You can depend on Lumarith for high dielectric and tensile strength and freedom from cracking. It stands up under abrasion hazards while retaining necessary flexibility.

Supplied in films, sheets, rods, tubes and molding materials. Films available plain or in special mat finish for easier winding, reducing slippage and increasing visibility. "Lumarith for the Electrical Industry" is a reference booklet you'll want to keep handy. Send for it today. Celanese Celluloid Corporation, a *division of Celanese Corporation of America*, 180 Madison Avenue, New York 16, N. Y.

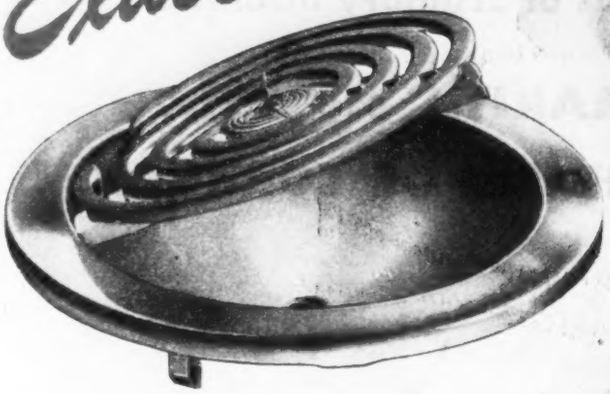
Celanese yarns and fabrics with the same basic electrical characteristics as Lumarith are especially manufactured for the electrical industry. For data, address Celanese Corporation of America, 180 Madison Avenue, New York 16, N. Y.

LUMARITH*

A Celanese Plastic*

*Reg. U.S. Pat. Off.

Exact Fit



Guaranteed

18 DIFFERENT INSTALLATION RINGS TO FIT EVERY MAKE OF ELECTRIC RANGE

When You Recommend This Better Heating Unit for ANY Electric Range

Regardless of the make of the Electric Range, we'll guarantee to fit it exactly with T-K Heating Units. 18 installation rings make them readily adaptable to *any* electric range. They are designed for quick, easy installation. Look for the T-K "symbol of service" in the center of heating units on many of America's finest ranges. They give the highest degree of cooking and heating efficiency. Stock and feature T-K Replacement Units as well as T-K equipped Electric Ranges. Ask for details, NOW!

T-K

BETTER ELECTRIC RANGE UNITS

TUTTLE & KIFT, Inc.

MAIN PLANT AND GENERAL OFFICES

1825 NORTH MONITOR AVE., CHICAGO 39, ILLINOIS

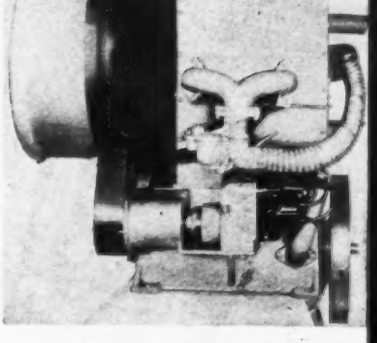
Domestic & Industrial Heating & Cooking Units • Switches • Controls

possibility of placing pole line inspection on a six instead of the three-year cycle, which has been the usual practice with untreated poles. The cumulative result of the ground line treatment is a reduction in labor and expense of pole line maintenance-inspection and in the need for new poles at a time when conservation of pole timber, labor and transportation are all important.

•

Smaller Truck Usable for Pumping Manholes

The use of a smaller truck on manhole pumping operations is a feasibility with the development of a small double-acting, two-cylinder gas motor. Weighing 5.1 lb. per hp., this engine, which develops 32 hp. at 2,200 r.p.m., needs but 26 by 21-inch



GAS MOTOR showing preheated air going to carburetor, magneto, distribution head and vertical exhaust

mounting space and 26 in. of head room.

The saving in weight and size of this Tabor Manufacturing Co., Philadelphia, development is obtained by drawing off approximately one-third of the excess heat from the inside of the cylinder in addition to normal cooling by conventional fins on the outside. This is done by drawing carburetor intake air through ports located in the middle of the cylinder; this air circulates around the hollow piston which is cut-away on the opposite sides of the walls to permit free flow of air around them. In addition, fins are built into the inner sides of the pistons, and baffle plates direct the air to them.

The engine is 2 cylinder, 4 cycle, has 3⅛-in. bore and stroke and a compression ratio of 6:1 when using 68-72 octane fuel.

DRYING PENICILLIN 48 TIMES FASTER BY ELECTRONIC HEAT

RCA System Reduces Production Time; Saves Factory Space; Cuts Cost

At a time when penicillin is needed fast, RCA engineers have developed a new electronic system for the bulk reduction of purified penicillin solution. Conventional "freeze drying" takes 24 hours to perform this step; the new RCA method does it in 30 minutes—48 times faster!

E. R. Squibb and Sons, manufacturing chemists to the medical profession, worked closely with RCA in developing the new process. The initial RCA 2000-watt electronic generator and associated equipment (shown at right) at the Squibb penicillin plant, New Brunswick, N. J., can concentrate in 24 hours enough penicillin solution to treat 4,000 patients requiring 500,000 Oxford units each.

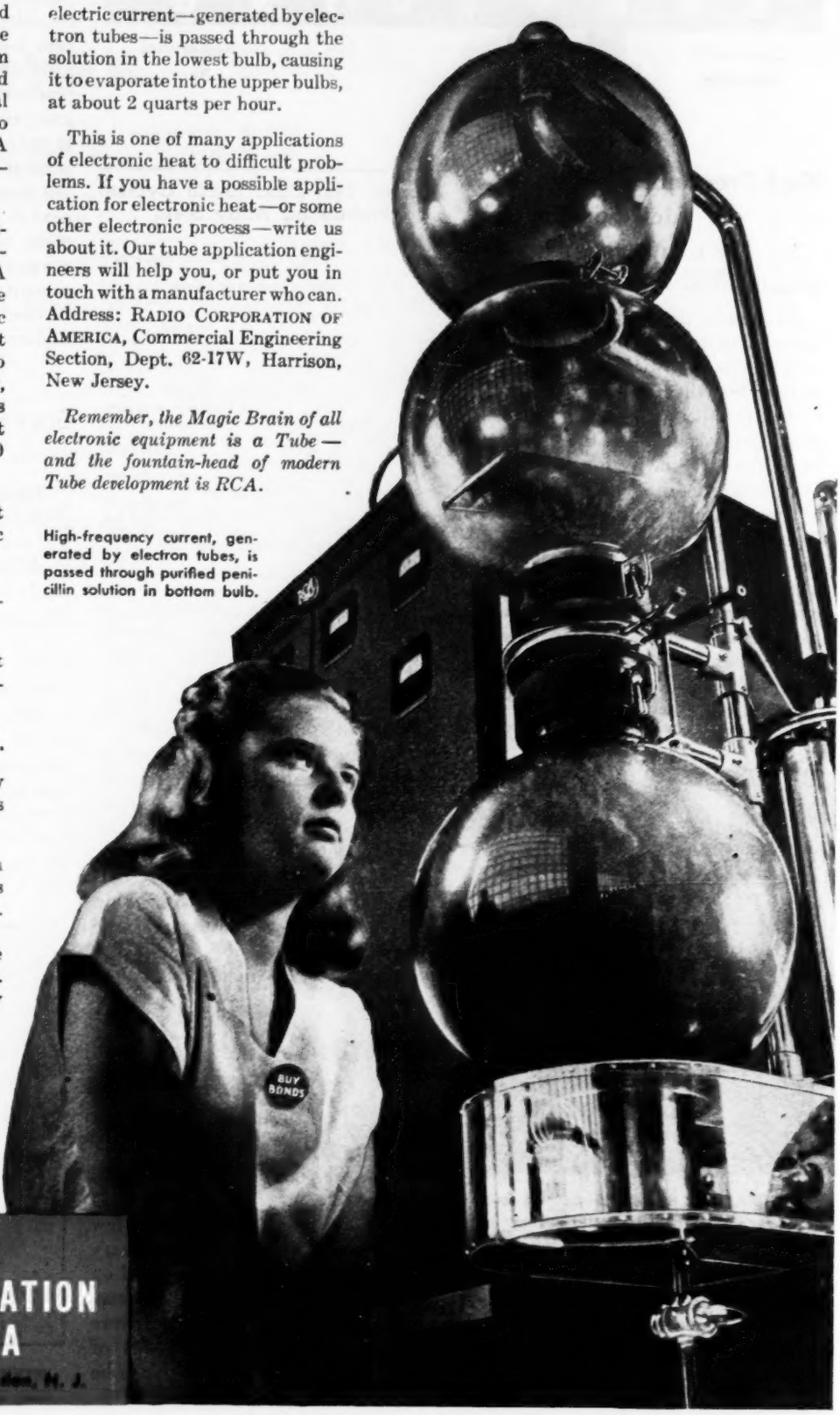
Squibb scientists disclosed that additional advantages of electronic heat include:

1. Savings of one ton of dry ice—$65—per day.
2. Large savings in initial plant investment compared with former process.
3. Reduction of floor space by 90%.
4. Reduction of maintenance by eliminating freezing apparatus and high-vacuum pumps.
5. Smoother flow of production with less chance of shut-downs due to mechanical difficulties.

Electronic heat is used to "boil" the purified penicillin solution at 50° F. at low pressure. High-frequency electric current—generated by electron tubes—is passed through the solution in the lowest bulb, causing it to evaporate into the upper bulbs, at about 2 quarts per hour.

This is one of many applications of electronic heat to difficult problems. If you have a possible application for electronic heat—or some other electronic process—write us about it. Our tube application engineers will help you, or put you in touch with a manufacturer who can. Address: RADIO CORPORATION OF AMERICA, Commercial Engineering Section, Dept. 62-17W, Harrison, New Jersey.

Remember, the Magic Brain of all electronic equipment is a Tube—and the fountain-head of modern Tube development is RCA.



High-frequency current, generated by electron tubes, is passed through purified penicillin solution in bottom bulb.

RCA

RADIO CORPORATION OF AMERICA

RCA Victor Division • Camden, N. J.

LOAD SERVICING

Commercial
Industrial

Residential
Rural

High-Frequency Heat Aids Forging Job

By L. M. DURYEE
Industrial Power Engineer
Connecticut Light & Power Co., Waterbury

To obtain precise control of the heated area in preparing to forge steel rods ranging in diameter from 0.75 to 1 in., the Allen Mfg. Co., Hartford, Conn., installed a "Tocco, Jr." unit about four years ago at its local plant. In practice a 1-in. section of a 10-in. piece is inserted in the inductor block of the apparatus and heated to 1,650 deg. F., after which it is placed in a heading and forged into a hollow-head screw cap. Only two relays and one bearing have had to be replaced since installation, and the consistently uniform results obtained have enabled the required volume of production to be maintained with steadiness. Under average working conditions about

PREHEATING REQUIRES but 10 sec. in preparing alloy steel 0.875 in. in diameter for forging at 1,650 deg. F.

10 sec. is required to heat each piece, as conducted energy flows along the rod for some distance, calling for extra B.t.u.'s, and the inductor coil in practice is relatively large. Some sacrifice in "coupling efficiency" is warranted in commercial induction heating because it is easier for the operator to insert a rod into a good-sized coil than into a coil which tightly fits the piece being heated.

Typical Test Data (9,600 Cycles) Preheating Alloy Steel

Diameter of work	0.875" (medium carbon steel)
Length to be heated	1⅛"
Bore of work coil ("Inductor Block")	1⅛"
Length of work coil	1¼"
Recess for insertion of rod to be heated	0.03"
Input of 9,600-cycle energy to coil	50 kw.
Seconds to heat	1.4
Temperature of work	1650 deg. F.
Field Amp.	3.6
Size of condenser at coil terminals	34.25 micro-farads
Kvar. of load circuit including condenser	0
Line volts—60 cycle	220 v.
Line amps.—60 cycle	227 amp.
Input to Motor 220 by 227 by 1.73 by .80 pf.=	69 kw.
Temperature of circulating water	300 deg. F.
Rating of motor	110 hp.
Rating of generator	100 kw.
Efficiency—motor to heater-coil $\frac{50}{69} \times 100 =$	72.5%

An example of a preheating test is given above for a run under virtually laboratory conditions. Here the time required was but 1.4 sec., but the piece was only 1.1 in. long (diameter 0.875 in.) The bore of the work coil or inductor block was 0.9375 in. This represents the ideal status from the heat transfer standpoint, and is of interest from that angle.

•

Maine Users Like Present Ranges

A cross-sectional survey of Central Maine Power Co.'s electric range users reveals that about 90 percent favor a table-top model for post-war service, and that in general few changes in design appear necessary when production is again resumed on a peacetime basis. Nearly 800 customers using major appliances were interviewed. Present dimensions of electric range ovens were found to be closely in line with household requirements, 89 percent of those queried being satisfied. Three percent want the oven higher, 5 percent prefer a wider oven and 3 percent favor greater depth.

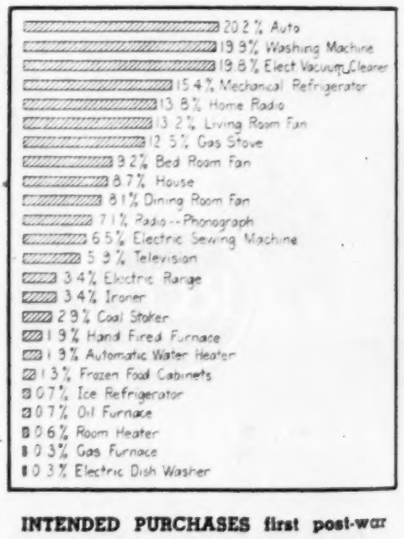
The size of surface units was approved by 95 percent, only 1 percent considering these too large and 4 percent too small. There appears to be little difference among city and rural homemakers as to the size, appearance and features of ranges desired. It was gratifying to learn that 98 percent of present range users will purchase another electric range when next in the market for cooking equipment, only 2 percent coming out for a gas range; also that 60 percent of present gas range users plan to switch to electrics when the time comes to replace that appliance.

•

Survey Urban Appliance Market

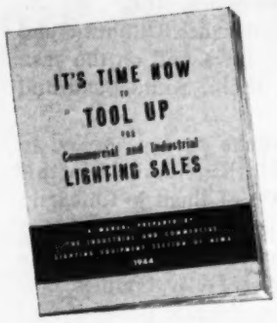
Appliance purchases aggregating $566,000 will be made after the war by urban families in the Chicago trade area alone, according to a study made by Ross Federal Research Corp. for the Chicago Tribune business survey department and displayed recently at the American Appliance Mart in Chicago.

The study, confined exclusively to urban families is based on 10,029 interviews in 43 cities within the Chicagoland area. This area encompasses most of Illinois, the upper part of Indiana, the western part of Michigan, lower Wisconsin and eastern Iowa. Most northerly city in-



INTENDED PURCHASES first post-war year by urban families in Chicago area

Frankly
WE THINK YOU'LL WANT THIS



Frankly we think you'll want this new NEMA manual . . . and that one of the friendliest things we can do is to call your attention to it.

Because it tells you how and why lighting can be an important postwar loadbuilder . . . and tells you simply, concisely and factually.

As you leaf through it, we think you will see how it checks with your own experience . . . and how it supplements your own postwar thinking with practical sales, advertising and promotional suggestions . . . which you can apply profitably in your own territory.

It puts into one package the ideas of many men who know utility problems intimately—and brings you the benefit of recent field surveys.

We'll be glad to send you a copy if you'll write us.

Sincerely,

A. F. Wakefield

MODERN LIGHT FOR MODERNIZATION

How Wakefield can help you . . . .

Wakefield lighting equipment is engineered for top efficiency and for pleasing overall effect. But we believe that's only part of a good lighting job. And that's why Wakefield is always glad to work with you for engineered lighting installations. Typical of the Wakefield units that can help you on essential jobs now is the BEACON. Modern and clean-lined in design, it provides high quality light at lower cost. Rigid louvers hinged for easy maintenance. Foolproof sockets help prevent accidents. Write for details.

Wakefield

THE F. W. WAKEFIELD BRASS COMPANY · VERMILION, OHIO

cluded is Marquette, Mich.; most southerly, Vincennes, Ind. At the western extremity are Ottumwa and Cedar Rapids, Iowa and on the east, Battle Creek, Mich., South Bend and Elkhart, Ind.

Findings of the survey applied to the 2,198,755 urban families in this area (1,190,957 of them in Chicago) are summarized in accompanying tables and charts. Diagrammed are the percentages of city families now owning various durable goods items; the percent indicating an intention to purchase specific appliances and goods during the first post war year. Tabulated for the electric range, washing machine, vacuum cleaner and refrigerator are survey data on (1) present ownership, (2) age, (3) indicated future purchases, (4) price preference and (5) total dollar value of the market.

A fair picture of how the surveyed urban families live is also given by the study. Of the 10,029 families 68.2 percent live in houses; 31.8 percent in apartments. Only 44.2 percent own their homes. Family income is distributed as follows: 22.4 percent $4,000 and up; 49.6 percent $2,000 to $4,000; 26.2 percent $2,000 and under; 1.8 percent no answer.

DURABLE GOODS now owned by urban families in Chicago area

Present Ownership and First Post-War Year Intended Purchases of Domestic Durable Goods in Chicago Trade Area

	Percent of Families Now Owning	Percent of Families Intending to Buy
Automobile	56.9	20.2
Washing Machine	65.4	19.9
Vacuum Cleaner	74.5	19.8
Mech. Refrigerator	73.7	15.4
Radio	98.9	13.8
Fan	—	9.2
Home	44.2	8.7
Radio-Phonograph	12.3	7.1
Elec. Sewing Machine	24.4	6.5
Television Set	—	5.9
Electric Range	8.5	3.4
Electric Ironer	7.9	3.4
Coal Stoker	9.0	2.9
Automatic Water Heater	13.2	1.9
Frozen Food Cabinet	—	1.3
Ice Refrigerator	12.5	0.7
Oil Furnace	5.5	0.7
Room Heater	11.1	0.6
Gas Furnace	3.0	0.3
Elec. Dish Washer	—	0.3

Survey Includes Dealers

Included in the survey were interviews with 2,000 appliance dealers in the area who volunteered information about their post-war plans. For instance: 76 percent said they will carry electric washing machines; 34 percent will feature one brand; 19 percent will handle only one brand exclusively and 5 percent said they had already committed themselves to one brand.

The composite view of the dealers as to what manufacturers should do to make their post-war business profitable is: Provide an adequate supply of merchandise in the first year after the merchandise is made available; protect the price structure and give strong advertising support.

What Will 2,198,755 Urban Families in Chicago Trade Area Buy Post-War

	Electric Range		Mechanical Refrig.		Washing Machines		Vacuum Cleaners	
	Percent	Units	Percent	Units	Percent	Units	Percent	Units
Present Ownership	8.5	186,894	73.7	1,620,482	65.4	1,437,986	74.5	1,638,072
Age								
Under 3 yrs.	19.2	35,883	11.1	179,873	11.2	161,054	10.5	171,998
3 to 5 yrs.	41.2	77,000	34.7	562,307	24.7	355,183	25.8	422,623
6 to 9 yrs.	24.4	45,602	29.2	473,181	24.7	355,183	22.2	363,652
10 to 14 yrs.	8.1	15,138	15.1	244,693	22.4	322,109	18.9	309,596
15 and over	7.1	13,269	9.9	160,428	17.0	244,458	22.6	370,204
Indicated Purchases								
First Post War Year	3.4	74,757	15.4	338,608	19.9	437,552	19.8	435,353
New Purchases		57,167		169,304		194,590		168,205
Replacements		17,590		169,304		242,962		267,148
Price Purchasers Expect								
Less than $100	1.6		0.5		20.8		39.3	
$100 to $150	8.2		12.5		12.8		7.0	
$150 to $250	30.0		28.4		7.1		1.0	
$250 to $350	2.8		2.1		0.4			
$350 to $450	1.1							
$450 to $500	0.1							
Don't Know	56.2		56.5		58.9		52.7	
Average Price	$194.00		$182.85		$111.78		$60.57	
Total Value of Indicated Purchases	$14,502,858		$61,914,472		$48,909,562		$26,369,331	

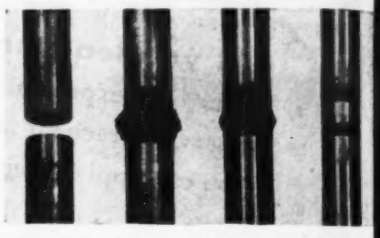
Metals Fused End-To-End By Flash Welding

Although applicable to areas as small as 6.0015 square inch, flash welding particularly lends itself to the welding of large cross-sections of materials without prohibitive peak power demands, according to the Resistance Welder Manufacturer's Association, Philadelphia, Pa.

High speed, low cost and reliability are inherent advantages. The flash or extrusion, resulting from the weld when removed and polished, leaves the weld joint almost impossible to detect.

Four steps in the end-to-flash welding of a cold-rolled steel rod are shown in the accompanying illustration. A similar procedure is followed in the edge-to-edge welding.

The first exhibit at the extreme left shows the two ends of the steel rod



STEPS in end-to-end flash welding

before the flash welding operation. The second shows the flash (extrusion) resulting from the weld. In the third exhibit, this flash has been removed and, in the fourth, the rod have been machined to the desired size. The finished weld is as strong as the metal and presents a surface capable of taking any finish that might be applied to the latter.

In flash welding the metal to be welded is clamped in an electrical circuit. These clamps are unique in that they must be not only good conductors of electricity, but strong enough to hold the material at twice the pressure needed for the push up. As the metals aproach each other, a flashing occurs, burning off any irregularities and reducing the metal to a plastic state. Timed to a split second, the final rapid upset forges the abutting surfaces together under high pressure, completing the weld.

The Resistance Welder Manufacturers' Association states that flash welding of this type has been used successfully in fusing the seam of metal pipes up to 40 feet in length and having walls one inch thick.

Make the Benjamin Trademark Your Guide to Better Lighting for Today and Tomorrow

UNLESS your plant requires no re-conversion and has been newly built or completely re-lighted during the last three years according to today's higher standards, you will soon be considering lighting recommendations and the specification of the best possible lighting equipment to meet today's and tomorrow's needs.

Naturally, you will want to specify lighting equipment which assures you the best possible lighting of the seeing tasks and, also, the lowest ultimate cost on your investment in terms of lighting efficiency, equipment life and maintenance expense.

When you make the Benjamin trademark your guide, you are assured of obtaining such equipment. This trademark is your assurance of lighting units that comply *with all recognized illumination, electrical and mechanical standards and applicable RLM specifications.* It is your assurance of:

—reflectors scientifically designed to insure the proper control and direction of light.

—highest reflection factors and light output to insure obtaining all the light you pay for.

—proper lamp shielding to minimize glare.

—an extra safety factor of durability which assures long fixture life and minimum maintenance and replacement costs; durability which has earned Benjamin units the reputation for being "built like battleships".

—equipment that is guaranteed against defects in material and workmanship.

Without cost or obligation on your part, let us place your name and the names of your associates on our list of those to receive the various Benjamin bulletins and other data to be made available during the next few months. These will be helpful to you in making a study of your lighting and in planning needed improvements. Just write Benjamin Electric Mfg. Co., Dept. K, Des Plaines, Illinois and ask for Benjamin Re-Lighting Service Data.

BENJAMIN TRADE MARK
Lighting Equipment
Distributed Exclusively Through Electrical Wholesalers

NEW EQUIPMENT

Starter

Gas-actuated fluorescent lamp starter; Glostat FS-5 for 4, 6, and 8 watt lamps, FS-2 for 15 and 20 watt lamps, and FS-4 for 30 and 40 watt lamps; **Sylvania Electric Products, Inc.**, Salem, Mass.

Starter contacts, which are normally open, are enclosed in a low-pressure argon gas atmosphere. Stationary contact consists of metal "flag" to make and break with a silver bar spot-welded to a movable bimetal element. When line switch is closed, argon gas glows and heats the bimetal element which momentarily closes to preheat the lamp cathode. Closing of the starter contacts said to eliminate the gas glow in the starter so that the movable element cools and returns to normal operating position and permits establishment of arc in the fluorescent lamp. Voltage drop across lamp is said to prevent recycling while lamp is in operation.

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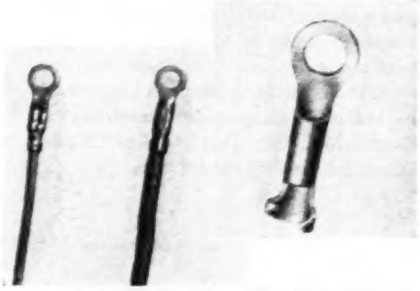
Solderless Terminal



"Uni-Crimp" three styles, No. UC-18-B for 18, 20 and 22 gauge wire, No. UC-14-B for 14, 16 and 18 gauge and No. UC-10-B for 10 and 12 gauge wire; **H. B. Sherman Mfg. Co.**, Battle Creek, Mich.

Terminal is said to be interchangeable with other terminals of this type. Installed with hand crimping pliers, or standard types of indenting dies. Made of one-piece of tempered copper.

Crane Control

Control for d.c. floor-operated cranes; common voltages; **Electric Controller & Mfg. Co.**, Cleveland 4, Ohio.

Controller panels for any combination of motions, with resistors for separate mounting, are said to be compact for mounting on crane girders (if desired). Pendant type station contains push buttons for all motions, indicating light, power failure and overload relay reset button. Overload and undervoltage relay protection provided. Arrangement said to minimize number of collector bars required. Panels are of tilting type; control terminals front connected.

•

Connector Tool

Hytool for connector installation; **Burndy Engineering Co.**, 107 Bruckner Blvd., New York 54, N. Y.

Spade of tool carries series of holes or "dies" which provide for installation of a number of connector sizes without changing parts or "dies." Two sizes are available MYG15ON for use on Navy Cable types DHFA, THFA, and FHFA, sizes 14 through 150, and types SHFA and SHFL sizes 4 through 125. No. MYG40ON is for DHFA, THFA and FHFA, sizes 200 through 400, and SHFA and SHFL sizes 150 through 400.

•

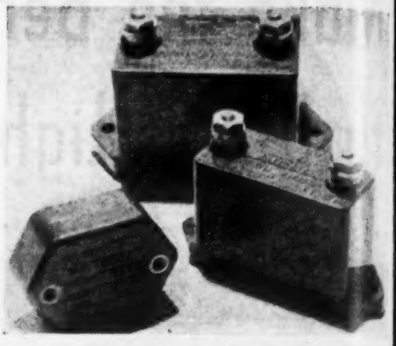
Transformer

Subway-distribution transformer; 10 to 200 kva.; 2400/4160 Y to 120/240 V. at 60 cycles; **Allis-Chalmers Mfg. Co.**, Milwaukee 1, Wis.

Shaped rectangularly, the tanks are fabricated from heavy gauge, rust-resistant copper-bearing steel plates. All joints are electrically welded. Said to be oil and water tight. Tank has recessed bottom to protect against rough handling and corrosion. Medium and larger sizes provided with steel tubes for cooling. Said to operate completely submerged without transformer damage or service interruption.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Capacitors



Lectrofilm capacitors; types 60, 65 and 70; **General Electric Co.**, Schenectady, N. Y.

Lectrofilm (synthetic dielectric material) capacitors said to be suited for radio frequency blocking and by-pass application in communication and other electronic equipment. Case 60 type, 100 to 10,000 mmf. with d.c. working voltages of 2500 and 1200. Case 65 type, 47 to 100,000 mmf. with working voltages of 4,000, 3,000, 2,000 1,500, 1,000, 500 and 300 d.c. Case 70 type, 47 to 100,000 mmf. with working voltages of 5,000, 3,000, 2,000, 1,500, 1,000, 500 and 300 d.c. Said to have low-loss plastic cases which protect interior against moisture.

•

Ladder

Industrial ladder with insulating boots; **Duo-Safety Ladder Corp.**, Oshkosh, Wis.

Industrial ladder (type F) equipped top and bottom with insulating boots. Rubber is reported to withstand high voltages. Top boot (FW-1) also prevents side slipping; bottom boot (FW-2) also acts as a safety shoe providing a footing for indoor and outdoor use.

•

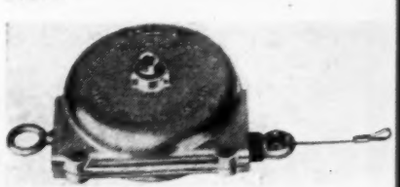
Expansion Fitting

Type "AX" conduit expansion fitting; conduit sizes ½-in. to 3-in.; **O. Z. Electrical Manufacturing Co.**, Brooklyn, N. Y.

Designed to compensate for expansion and contraction in a line of conduit. Head is sealed to keep out water or moisture. Said to be usable on bridges, tunnels, dams, etc. where long conduit lines are installed. Finished in cadmium plate or bronze.

•

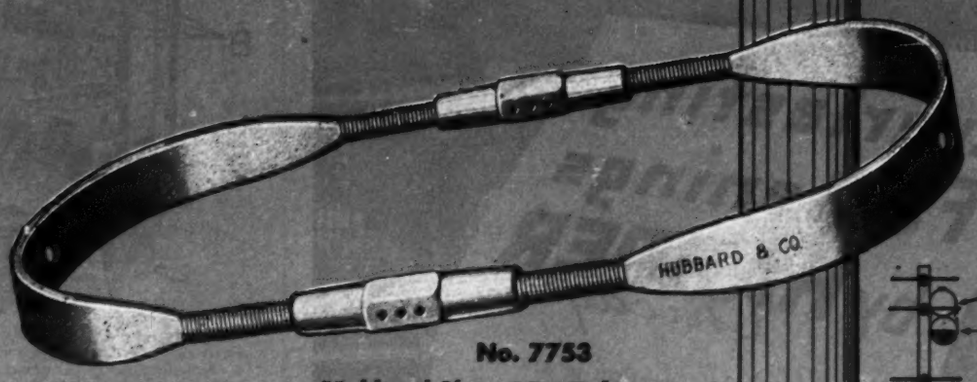
Reel



Retract-O-Reel; supports weights up to 10 lbs.; **Appleton Electric Co.**, 1701 Wellington Ave., Chicago 13, Ill.

Reel supports light-weight drills, screw drivers, assembly tools, etc., directly over

"Making Big Ones out of Little Ones"



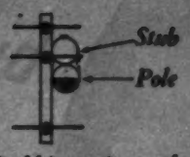
No. 7753

Hubbard Sleeve-Nut Pole Reinforcing Bands for Stubbing Poles

With most of our lumbermen handling knives and walnut gun stocks instead of axes and cedar, pole replacements are somewhat of a problem in many localities. Add to this, the difficulties of shipping and handling heavy materials amidst war time traffic congestion and the result is a scarcity of poles for some of our Utility Companies.

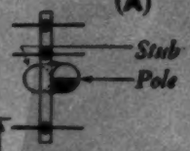
The problem is being partially solved on a temporary basis by pole stubbing. Discarded poles with rotted bottoms but firm wood above the original ground line are used as stubs. After cutting away the rotted butt and treating, stubs are set alongside the pole which is in service but in need of replacement. Hubbard Sleeve-Nut Bands are installed as shown in the diagrams.

Given a solid setting for the stub, the resultant structure will hold to the breaking strength of the average pole, as illustrated by the accompanying photo of a test.



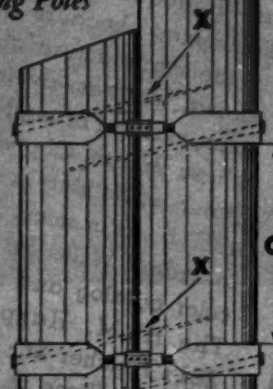
Stubbing "Across the Line"

(A)



Stubbing "On the Line"

(B)



Diagrams above show the usual methods of stubbing which are (A) "across the line" and (B) the alternative method, "on the line". Dowels (X) may be used in either case but are especially recommended for "on the line" installations. Separation of bands (C) is 26" to 50" depending on potential line strain and pole height.

Testing a Stubbing Band Assembly

Above pole broke at 48,000 foot pounds without damage to the Hubbard Sleeve-Nut Stubbing Band. Pull was applied "in line" with conductors, stubbing was "across the line". Dowels were used.

HUBBARD AND COMPANY

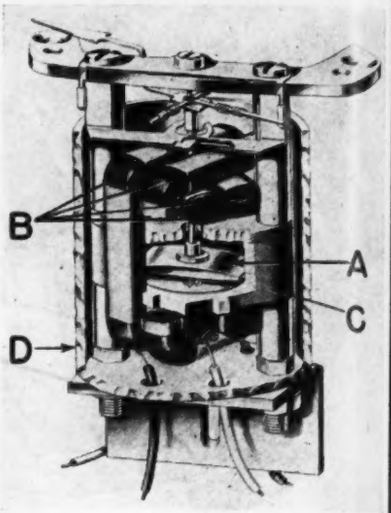
PITTSBURGH OAKLAND CALIFORNIA CHICAGO

Everlasting
Fastenings
by HARPER
Chicago
The Harper organization is known as "Headquarters for Everlasting Fastenings" because it specializes in the manufacture of bolts, nuts, screws, washers, rivets and accessories made of Brass, Naval Bronze, Silicon Bronze, Copper, Monel and Stainless. Nothing in common steel. 4360 Items in stock. Specials made to order. Write for 104 page, 4 color catalog and reference book.
The H. M. Harper Company,
2611 Fletcher St., Chicago 18, Ill.
Branch offices in principal cities.

work area while operator is otherwise engaged. When operator has finished using a portable tool, the device lifts it up out of the way but within easy reach.

•

Ratio Meter

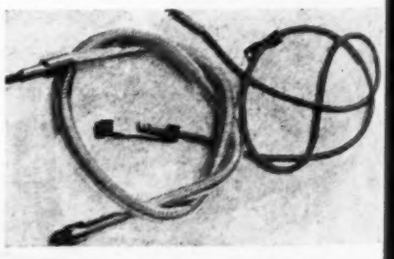


Electrical ratio meter; A, moving magnet; B, Actuating Coil; C, damping housing; D, magnetic shield; **Thomas A. Edison, Inc.,** West Orange, N. J.

Design of the meter movement inverts the conventional arrangement of such instruments by using a small moving permanent magnet vane, the position of which is governed by the ratio of the currents in two sets of stationary actuating coils, placed at an angle with one another. This arrangement is said to provide a rugged construction and permits the elimination of all hair springs. The movement may be adapted to any service in which it is desired to indicate the ratio between the values of two currents or voltages, independently of their magnitude. Where it is desirable to have the pointer swing off one end of the scale when de-energized, a small pull-off magnet is attached to the upper bridge for this purpose. The instrument will operate at currents down to 300 microamperes. Scale span covers 120 circular degrees.

•

Heating Unit



Flexible "serpentine heating unit;" 15-20 watts per lineal inch; **H & A Manufacturing Co., Inc.,** Buffalo, N. Y.

Of metal-ceramic construction, the unit is made in varying lengths and diameters and in capacities upwardly to 15-20 watts per lineal inch. Temperatures up to 1000 deg. F. are said to be maintained without deterioration of steel-cermaic structure. Said to be usable for the heating of pipes and valves.

George Washington Elm, Mass. *Etching by Edward C. Smith*

. . . Tree-Trimming to Promote Reliable Power Service

Yes, Tree-trimming—to keep branches clear of power lines, to eliminate interference of service, to preserve trees, their shapes, their lives . . .

Tree-trimming is unquestionably first among the practices which the utilities will apply to promote reliability of service.

Keeping the tree branches clear of the power wires is such a significant item that a majority of the industry have already placed tree-trimming at the top of the list of post-war practices to promote this reliability of power service.

Indeed, many public utility companies have been using the Asplundh Tree Expert Company's services. With post-war expansion the Asplundh Tree Expert Company will be in a position to take care of additional post-war needs.

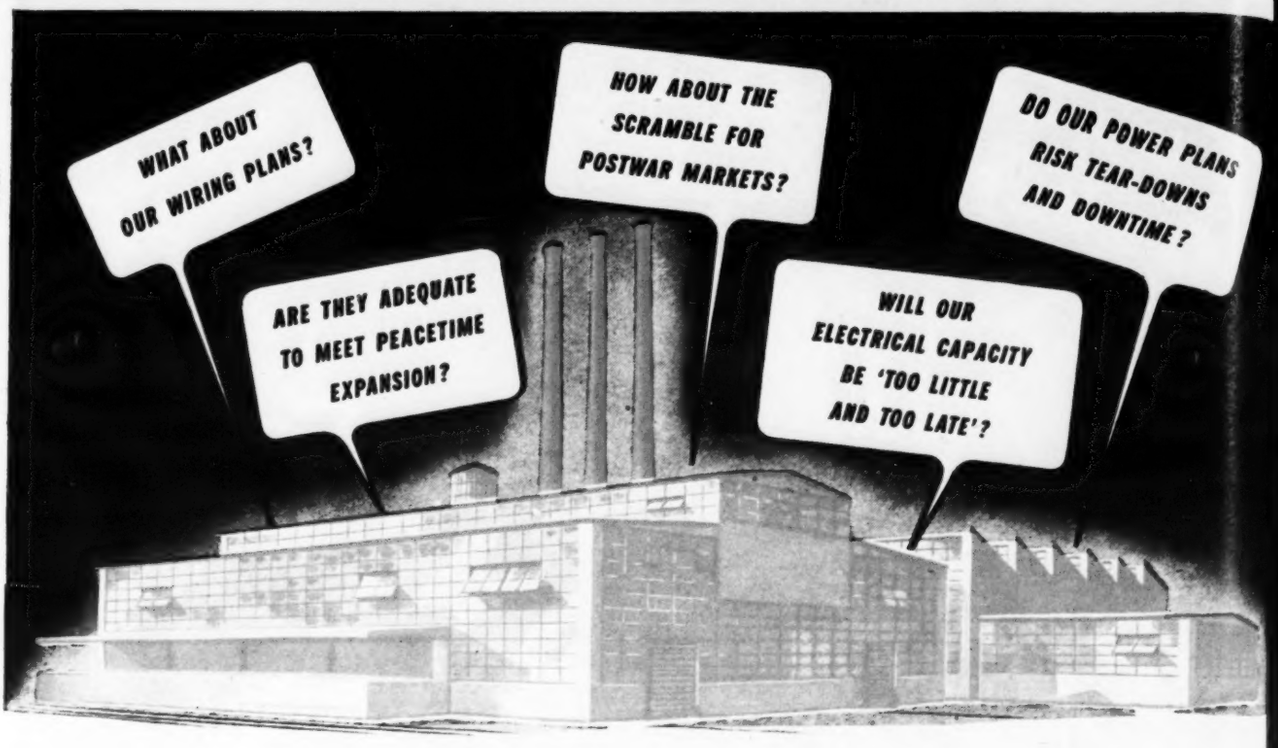
The 675 Asplundh Tree Expert Company men, returning from the armed forces, will enable our Company to meet growing needs.

Economical Line Clearing

ASPLUNDH TREE EXPERT COMPANY
JENKINTOWN • PENNSYLVANIA

BRANCH OFFICES: Chicago, Ill.; Binghamton, N. Y.; Columbus, Ohio; Tulsa, Oklahoma; Alexandria, Va.; Washington, D. C.; Baltimore, Md.; Charlotte, N. C.; River Edge, N. J.; New Castle, Pa.; Pittsburgh, Pa.; Omaha, Nebr.

Because of the basic importance of adequate wiring to the entire electrical industry, Anaconda is presenting messages like this in a wide list of national publications.


WHAT ABOUT OUR WIRING PLANS?
HOW ABOUT THE SCRAMBLE FOR POSTWAR MARKETS?
DO OUR POWER PLANS RISK TEAR-DOWNS AND DOWNTIME?
ARE THEY ADEQUATE TO MEET PEACETIME EXPANSION?
WILL OUR ELECTRICAL CAPACITY BE 'TOO LITTLE AND TOO LATE'?

BE SAFE – BE CERTAIN

Wire Ahead!

If the facts below make sense, check up on your wiring plans *now!*

FUTURE MARKETS

Foresighted market surveys won't mean much if plant wiring and service equipment capacity don't back up potential volume.

NEW DEVICES

Do your plans anticipate the huge increase in the use of electricity—the power demands of new, complex electrical machines?

COSTLY TEAR-DOWNS

Figure the expense of possible downtime and labor costs for emergency wiring and equipment.

OBSOLESCENCE

What about your banker? He'll want to be sure that electrical efficiency is adequate to keep your plant a prime commercial risk.

POSTWAR EMPLOYMENT

You'll want to help assure places for the horde of returning men. Don't let inadequate wiring cramp your personnel.

Obviously unwired planning will cost a lot more than planned wiring. Wire Ahead! Have a talk with your electrical contractor, power engineer or utility power engineer.

44251-A

ANACONDA

ANACONDA WIRE & CABLE COMPANY

25 Broadway, New York 4 . . . Sales Offices in Principal Cities

Well-Planned Power is Future Selling Power—Wire Ahead!

NEWS ABOUT PEOPLE

Trumbull Makes Changes in Executive Set-Up

Executive officials of the Trumbull Electric Mfg. Co., Plainville, Conn., who founded the business in 1899 and have managed its affairs ever since, have resigned from active service, effective December 31. They are John H. Trumbull, president; Frank T. Wheeler, vice-president; Henry Trumbull, treasurer; and Stanley S. Gwillim, secretary and general manager. The successors are: president, Elmer T. Carlson, at present manager of the Trumbull company's works at Norwood, Ohio; vice-president in charge of sales, Robert C. Graves, present director of sales; vice-president in charge of manufacturing, Cecil A. Bedford, present managing engineer; secretary and treasurer, Herman A. Papenfoth, present chief accountant; assistant secretary and treasurer, Richard L. Goodwill, present tax accountant. The new officers, who will take over on Jan. 1, 1945, have been associated with the Trumbull organization for many years.

John H. Trumbull, retiring president, was an electrical contractor in Hartford before forming the Trumbull organization. He is president of the Plainville Trust Company and on the directorate of many organizations. He served in the State Senate two terms, during the last term being President Pro Tempore, and was Colonel on the Governor's staff. Elected Lieutenant Governor in 1924, Mr. Trumbull became Governor immediately after inauguration as Lieutenant Governor, due to the appointment of the Governor-elect to a vacancy in the U. S. Senate. He was nominated and elected Governor for the next two terms. When Governor, he was given a degree of LL. D. by Wesleyan University. He is a past-president of NEMA and has been active for many years in the affairs of the organization.

Mr. Wheeler, retiring vice-president, was assistant superintendent in a manufacturing concern in Southington, Conn., before the formation of the Trumbull organization. He is a director and officer of many industrial organizations. Mr. Wheeler was present at the first meeting of the Associated Manufacturers of Electrical Supplies and was on the committee of organization and working rules. He was twice on the Board of Governors of the National Electrical Manufacturers Association, serving for twelve years on its standards committee. He has also served as secretary or chairman of several sections of NEMA. He has just retired as treasurer of NEMA and with that office served as chairman of the budget allocation of dues and the regulatory legislation committee. Mr. Wheeler has been active in committee work for the American Standards Association and also represented NEMA on the American Standards Council. He has been on many advisory committees of the Underwriters' Laboratories, Inc.

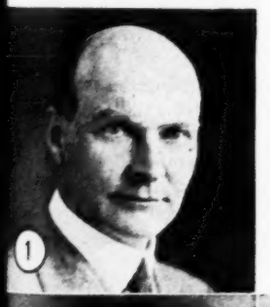
Henry Trumbull, retiring treasurer, was superintendent of a trolley company in Southington before starting the Trumbull organization. He served for many years on the New England Council and has been a director in the National Association of Manufacturers and president of the Connecticut Chamber of Commerce. Mr. Gwillim, retiring secretary and general manager, was employed by a coal and lumber company before joining Trumbull Electric.

Mr. Carlson, the newly elected president, was graduated from Northeastern University and following graduation he taught at the University for a year. He then was engaged in the electrical contracting business for a while and later was employed by the Hixon Electric Co. of Boston as an engineer. He joined the Trumbull organization as a sales representative in the Boston office district in 1928, later being transferred to the old Trumbull Ludlow factory as sales manager, and a few years ago he became general manager of the present Norwood, Ohio, works. Mr. Carlson represents Trumbull in NEMA activities.

Mr. Graves, the newly elected vice-president in charge of sales, is an electrical engineer, graduating in 1918 from the Rensselaer Polytechnic Institute of Troy, N. Y. Immediately upon graduation he served as an ensign in the U.S.N.R.F. in World War I. Following discharge from military service he was employed by the Trumbull company as an estimator in the switch and panel division, of which division he became manager in 1922 and held that position until 1935 when he became director of sales. For many years he has been active in the National Electrical Manufacturers Association, being recently elected chairman of the knife and enclosed switch section. At present he is a member of the knife and enclosed switch advisory committee of the WPB at Washington.

Mr. Bedford, vice-president in charge of manufacturing, joined the organization in 1917 as a draftsman. After working through various departments, he became managing engineer. He represents the Trumbull company in various sections of NEMA.

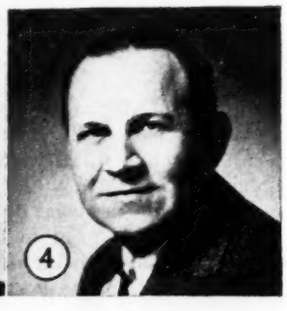
Mr. Papenfoth, secretary and treasurer elect, joined the organization in 1917 as assistant in the cost department, and Mr. Goodwill, who is assistant secretary and treasurer elect, entered the cost department in 1922.



1 John H. Trumbull

2 Frank T. Wheeler

3 Robert C. Graves



4 Elmer T. Carlson

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▶ NEAL THAYER, for the past seven years superintendent of the Elkhorn, Wis., Light and Water Commission, has been chosen as manager of the Jonesboro, Ark., city water and light plant, succeeding Lloyd M. Rebsamen, who resigned to enter private business. Mr. Thayer will assume his duties at Jonesboro December 15. Mr. Thayer was

graduated from the University of Wisconsin in 1927 and was connected with the Toledo Edison Co. before going to Elkhorn.

•

New Officials Appointed by Reliance Electric

Announcement has been made by the Reliance Electric & Engineering Co., Cleveland, of the election of Clarence L. Collens, for 37 years president, to the newly created position of chairman of the board. Mr. Collens will be succeeded in the presidency by James W. Corey, sales vice-president since 1940. Announcement was also made of the resignation, to become effective at year's end, of H. M. Hitchcock, senior vice-president and treasurer, and the election of A. M. MacCutcheon, engineering vice-president, to the office of senior vice-president upon Mr. Hitchcock's retirement.

Also effective immediately for reasons of health, C. V. Putnam retires after 38 years with the company, to be succeeded in the office of secretary by Roscoe H. Smith, who will continue his duties as head of the sales promotion department.

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▶ JOHN J. MOFFATT has been appointed Pacific Coast manager for the electric appliance division, Westinghouse Electric & Manufacturing Co., succeeding J. F. O'Donnell, who has been transferred to Mansfield to take charge of the contract sales department. In his new position Mr. Moffatt will have charge of electric appliance division activities throughout an area comprising all or parts of nine western states, Alaska and Hawaii. He will make his headquarters at San Francisco. Mr. Moffatt joined Westinghouse in 1927.

▶ DOUGLAS DOW, for the past four years on military leave from the Detroit Edison Co., serving in the United States Army with the rank of Lieutenant Colonel recently returned to the Detroit utility. His present assignment is in the sales department in charge of commercial research.

▶ THOMAS J. SCULLY has been appointed sales manager of the equipment division of the Griswold Manufacturing Co., Erie, Pa., succeeding Morris E. Miner, who has resigned to devote his attention to his own enterprise. Mr. Scully has been associated with the Philadelphia Electric Co. for more than 17 years and has been connected with commercial cooking promotion and jobber sales for more than a decade.

▶ R. G. SLAUER has been appointed manager of the applications laboratory of Sylvania Electric Products Inc., with headquarters in Salem, Mass. Mr. Slauer has a background of more than 18 years experience in the lighting industry and is widely known for his educational activities having conducted at one time a special correspondence course for the Westinghouse Co., with which he was associated for 14 years prior to his Sylvania appointment.

•

Florida Utility Assigns New Duties to Bailey

Announcement has been made of the appointment of J. F. Bailey to the position of assistant to the president of the Florida Power Corp., St. Petersburg, Fla.

A native of West Superior, Wis., Mr. Bailey is a veteran in the utility business, having served a number of utilities in Minnesota, Nebraska and the

Middle West. He joined the Florida Power Corp. as a division manager in 1930. In February, 1938, he was appointed vice-president and general manager of Georgia Power & Light Co. and a few months later was named president of that utility.

In addition to his new position, Mr. Bailey will retain the presidency of Georgia Power & Light. In his present capacity he will be in direct supervision of all local and division managers of the two companies and also the new business department.

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▶ ARTHUR M. WILLIAMS, JR. has been appointed personnel director of the South Carolina Electric & Gas Co., Columbia, S. C. Mr. Williams had been connected with the legal division of the OPA state office prior to his appointment. He is a graduate of the University of South Carolina law school.

D. M. Salsbury to Direct Operations for Wesco

David M. Salsbury has been elected vice-president and general manager of the Westinghouse Electric Supply Co. In his new position Mr. Salsbury will head the company's operations, reporting to the president.

Mr. Salsbury started his career with the Northern Electric Co., Calgary, Canada, in 1915. The following year he joined the Western Electric Co., Oakland, Calif., and in 1917 went with the Valley Electric Supply Co., Fresno. He became affiliated with the Electric Railway & Manufacturers' Supply Co. of San Francisco in 1918, which was acquired by Westinghouse Electric Supply Co. two years later. In 1933 he was appointed manager of the Supply company's Salt Lake City branch, when Westinghouse took over the Inter-Mountain Electric Co. Mr. Salsbury was named North Pacific district manager with offices in Seattle, Wash., in 1939 and four years later he was transferred to the New York office as general manager for the company. Mr. Salsbury is on the executive committee of the National Electrical Wholesalers Association.

OBITUARY

▶ DONALD W. MCCROSKEY, advertising manager for the I.T.E. Circuit Breaker Co., Philadelphia, died on November 13 in his home at suburban Lansdowne, after a brief illness. He was 46 years old. For several years, Mr. McCroskey was an electrical engineer with the General Electric Co., specializing in technical sales. He was a graduate of the Sheffield Scientific School of Yale University and was a member of the National Industrial Advertisers Association.

▶ GORDON O. THURMAN, supervisor of mechanical and electrical engineering laboratories at the University of Kentucky, died on November 6 at his home in Lexington in his sixty-second year. Mr. Thurman had been associated with the university forty years.

▶ CHARLES W. ERSKINE, 57, general counsel for the Oregon public utilities commission, died November 6 in a Portland hospital after an extended illness. Mr. Erskine was born in Iowa, but had been a resident of Oregon since 1903. He was graduated from the University of Oregon in 1910 and later attended law classes at Williamette University under the late Senator Charles L. McNary. Mr. Erskine was appointed to the commission five years ago.

ILLINOIS

High Tension Gooseneck Porcelains for Transformer Entrance Wires

• Accuracy in control of production of ILLINOIS Porcelain assures exact dimensions plus high mechanical and high dielectric strength for perfectly balanced insulators. All sizes and shapes are available for high tension transformers of every type—ease of installation assured because of uniformity —right fit means dependable service.

ILLINOIS ELECTRIC PORCELAIN CO., *Macomb, Illinois*

MANUFACTURING MARKETS

"Management Group" Meetings Urged

Sales managers will find their jobs made much easier for them if they will see that other key executives in their own organizations — engineering, purchasing, planning, scheduling, treasury and accounting, legal and patent executives—learn as much as possible about how their own company's products are sold and distributed.

This opinion was expressed by R. C. Cosgrove, vice-president and general manager, manufacturing division, The Crosley Corp., Cincinnati, when he addressed the Mid-Western Sales Congress, held last week under the auspices of the Chicago Sales Executives' Club.

"Very seldom do engineering and manufacturing people—in the electrical appliance business, at least—have an understanding of the functions of the sales department," said Mr. Cosgrove, speaking on "The Relationship of Sales Management to Top Management."

Mr. Cosgrove stressed the importance of regular "Management Group" meetings at which top management sits down with sales management, engineering, manufacturing, purchasing, legal and other divisional executives and together they help shape policy.

At the same time, Mr. Cosgrove pointed out sales management's responsibility and obligation to top management.

•

Pole Shortage Partly Due to War Working Farmers

Failure of farmers to market utility poles from their wood lots and from second growth timber has contributed to the present shortage, A. W. Brae, manager of the Everett, Wash. branch of National Pole & Treating Co., pointed out recently. Many farmers have found it more profitable to work in war industries if they have any extra time. However, he expects farmers to play an important part in the post-war market. The pole shortage is that great at present that often it is necessary to cut down long poles to fill orders despite the fact that this practice leads to excessive waste.

•

Allis-Chalmers Dividend

A year-end dividend of 90 cents a common share has been declared by the Allis-Chalmers Manufacturing Co. for payment on December 20. This increases disbursements for 1944 to $1.65 from $1.25 paid last year.

•

Starts to Make Cleaners

WPB has granted the Eureka Vacuum Cleaner Co. permission to start the production of vacuum cleaners, H. W. Burritt, president of the company, has announced. Mr. Burritt added that the company expects to make initial deliveries during the first part of 1945.

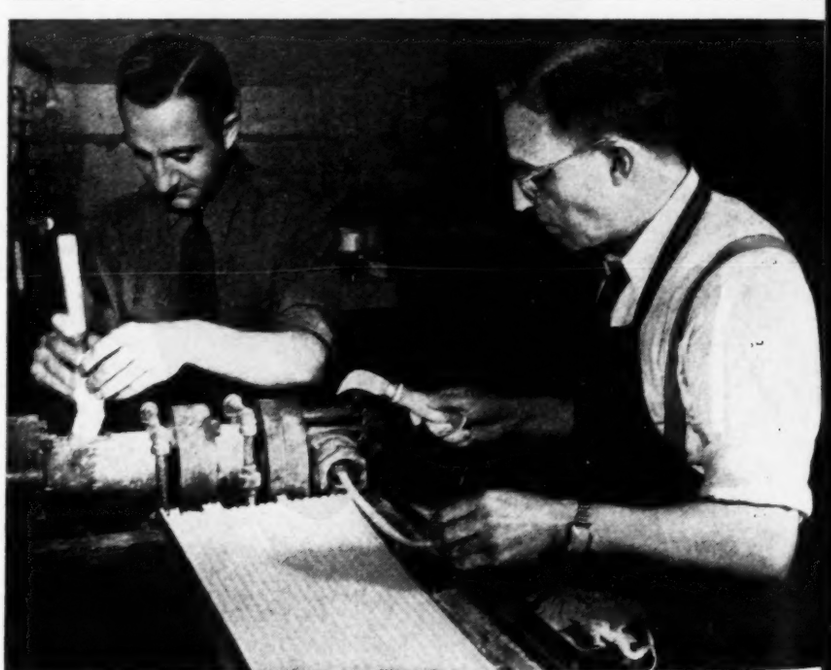
Formica Outlines Post-War Program

The Formica Insulation Co. will endeavor to further expand its types of laminated plastic products for post-war applications "through the fullest utilization of the developments acquired and attained during wartime," D. J. O'Conor, president of the company, declared at the company's post-war planning conference held recently in Cincinnati.

Mr. O'Conor, said "many new applications of laminated plastics will be usable in the post-war tomorrow" and "we of Formica are preparing to offer facilities and product to meet what is expected will be a pent-up demand." He added, "it is our desire to maintain the position Formica has maintained in the laminated plastics field, and we are gearing production and distribution forces to meet post-war market needs."

Continued production of laminated plastic products for industrial, decorative and consumer uses, he said "may have further expansion to include additional fabricating and veneering operations."

Mr. O'Conor informed the conferees that a new boiler plant installation is in course of completion which will provide adequate power and heating facilities for the plant. This addition represents an outlay of about $175,000.

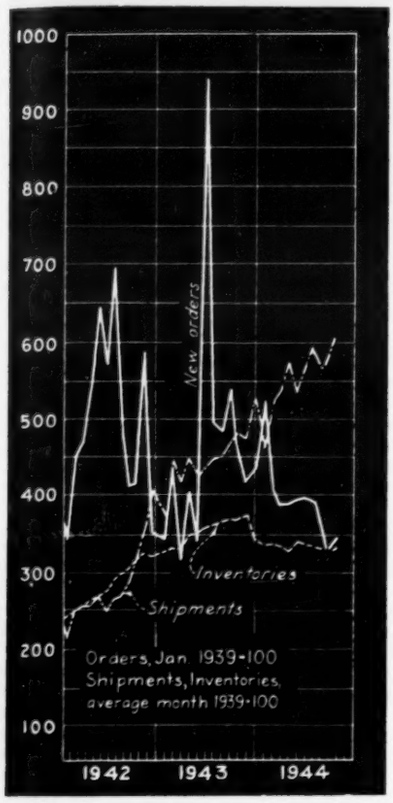


HEAT-RESISTANT RUBBER FOR GASKETS—Silicone rubber gaskets for high temperature applications are shown being extruded at the General Electric Co.'s plant (Resin and Insulation Materials Division). These gaskets have played an important part in overcoming heat problems in equipment for the "services." Tests have shown that elasticity will be retained for days at a temperature of 300 deg. C.; estimates are given for continuous operation at 150 deg. C.

Machinery Orders Rise in September

The value of new orders received by manufacturers of electrical machinery during the month of September increased slightly over the total reported for the month of August, according to the figures released by the Bureau of Foreign and Domestic Commerce. The index compiled by the Bureau advanced to 348 from 326 (revised) in August. It stood at 542 in September, 1943.

Electrical machinery shipments also advanced in September, the index moving upward to 609 from 565 in August. This compares with 469 in September, 1943.



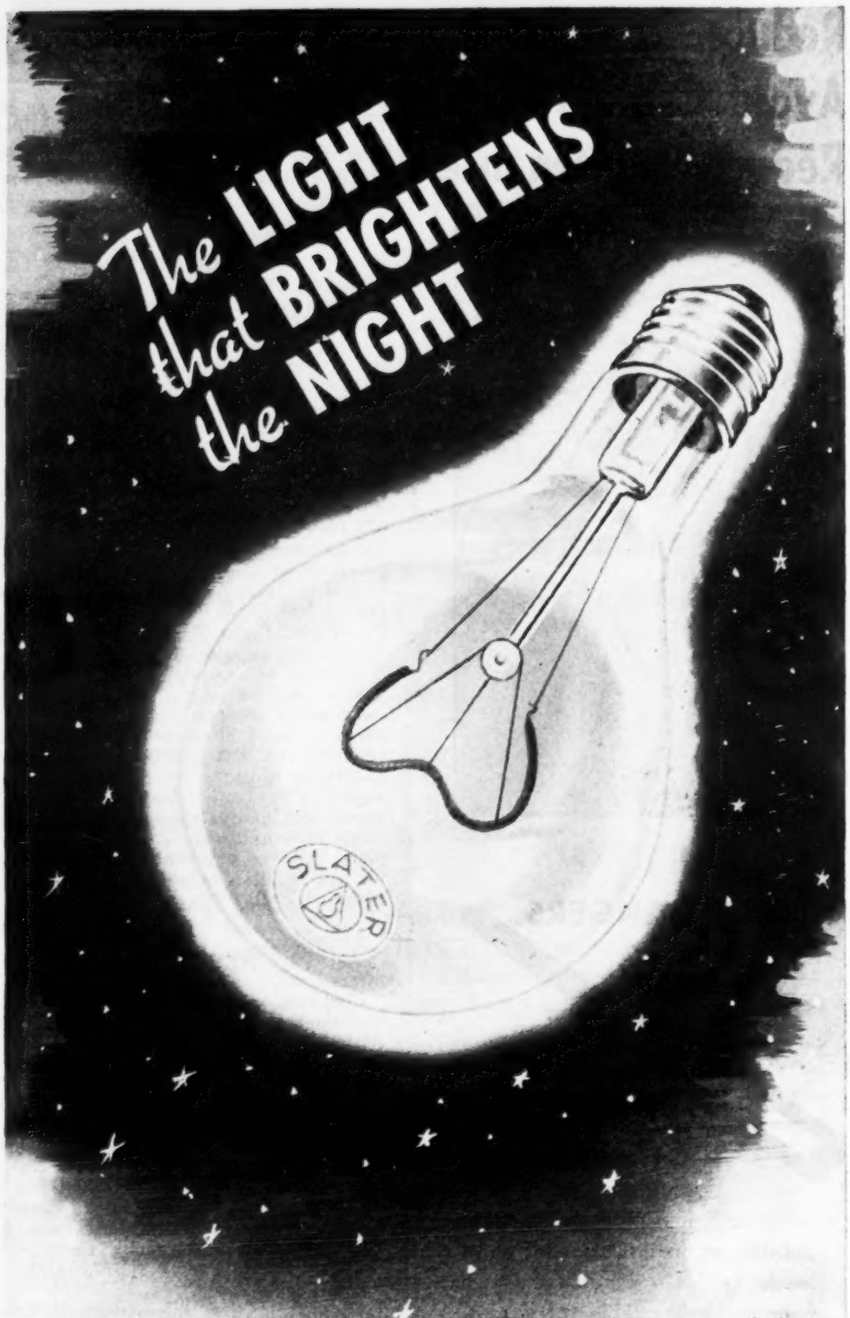
ELECTRICAL MACHINERY INDICES of Bureau of Foreign and Domestic Commerce

The index of the value of inventories of electrical machinery manufacturers decreased, moving downward to 327.4 in September from 334.8 in August. The index stood at 371.2 in September, 1943.

•

G.E. Opens Fungus Farm

A scientific fungus farm—one of the first of its kind—has been established at General Electric's Schenectady Works Laboratory so that engineers, by studying the characteristics of the mysterious growth, may prevent its interfering with the best performance of war equipment.



Lighted streets are SAFE streets . . . and uniform, maximum lighting efficiency can only be obtained by the use of dependable, quality-built lamps.

SLATER lamps provide high lumen output and effective brilliance to insure evenly distributed reflection throughout any street lighting system.

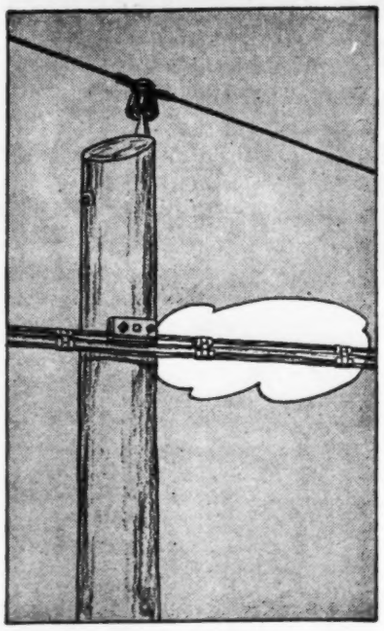
Catalog upon request.

SLATER ELECTRIC & MFG. CO.

MANUFACTURERS OF STREET LIGHTING LAMPS AND ELECTRONIC TUBES

BROOKLYN, NEW YORK

Reduce Outages
Avoid Cable Wear
Reduce Maintenance



RELIABLE CABLE HANGERS

prolong life of cables and conserve strategic materials by eliminating wear on cable sheaths or on insulation of hand made cables. Reliable cable hangers hold cable and messenger together tightly with wide bearing surfaces which eliminate snaking and chafing. They are easily applied and make installations that are permanent and very neat.

Reliable
ELECTRIC COMPANY
OVER 35 YEARS SERVICE TO THE UTILITIES
3140 CARROLL AVENUE · CHICAGO 12 ILLINOIS

Field Reports on Business

Large Government installations on the Pacific Coast are reaching the electrical order stage. Lighting supplies and wiring materials are very active. The electrical merchandising situation remains very tight as to supplies. Union Electric Co. of Missouri has announced plans for a $100,000,000 program.

CHICAGO

Estimates based on proposed capital expenditures for 1945 thus far announced by electric utilities in this area indicate that the coming year probably will see the largest allocations for new utility construction of any year since 1942. However, continuation of the European War into 1945 with its inevitable effect on the release of equipment and materials, coupled with a probable shortage of manpower, may delay execution of projected plans six months.

WPB approval has been granted, recently, for the manufacture of a 10,000-kw. turbogenerator by Allis-Chalmers Manufacturing Co., Milwaukee, for the Boone, Iowa, generating station of Iowa Electric Light & Power Co., Cedar Rapids. Installation of the unit and an associated transformer bank is expected to be completed late next year.

First step in a contemplated ten-year construction program announced by Union Electric Co. of Missouri that calls for expenditure of $100,000,000 is addition of 120,000 hp. of generating capacity at Venice station in St. Louis. This addition, it was stated, will necessitate a proportionate increase in transmission facilities. Announced plans call for expenditure of $45,000,000 for new facilities by the company between 1945 and 1950.

NEW YORK

Civil engineering construction volume in Continuental U. S. last week totaled $29,400,000. This volume exceeded the $8,805,000 reported for the holiday shortened preceding week, but was 57 percent below the total reported to *Engineering News-Record* for the corresponding 1943 week. Private construction was 76 percent lower than in the corresponding week last year. Public construction was down 32 percent due to the 49 percent decrease in federal work, as state and municipal construction was 266 percent higher. The week's construction brought 1944 volume to $1,577,354,000 for the 46 weeks.

Department store sales advanced 9 percent for the week ended November 11, compared with sales in the corresponding week last year, the Federal Reserve Board has reported. Sales of the New York City department stores showed an increase of 10 percent in the week, compared with the similar week a year ago.

NEW ENGLAND

Plans are under way for the construction of a large plant to make magnesium products in Massachusetts, by J. R. Worcester & Co., Boston engineers, for the Wyman Gordon Corp., Worcester. Energy is to be supplied by the New England Power System, and several thousand horsepower may be required. Ralph E. Flanders, Governor of the Federal Reserve Bank of New England, is advocating modernization of the Boston waterfront, Atlantic Avenue and East Boston districts, which if carried through will call for substantial electrical equipment and supply orders. B. F. Sturtevant Co., Hyde Park, Mass., has sold eight roofvane type fans to the Boston & Maine Railroad to remove toxic gases from the Diesel engine testing shop at Mechanicsville, N. Y., each driven by a ¾-hp. Sturtevant motor and having a capacity of 6,060 cu. ft. per minute.

A Westinghouse series capacitor installation rated at about 100 kva. has been made at the factory of the Wheeler Reflector Co., on the Brockton Edison System to improve regulation in connection with electric welding.

Industrial electronic applications are gaining in number, and equipment for precision work in the temperature control field is active. Storage batteries are in heavy demand for industrial and automotive applications, but these are moving only under high priorities. Counter sales of lighting supplies and wiring materials are very active.

Bearing manufacturers in Connecticut have sold more than $300,000 worth of this product in the last month. The Navy has bought cable from the Boston Insulated Wire & Cable Co., electric water sterilizers from Aetna Scientific Co., Cambridge, portable electric drills from Franklin Supply Co., Providence, and radio and radar equipment is still in heavy demand. Wiring supply bids are active in the manufacturing field, and resin-covered magnet wire, mica capacitors, and pumping units are moving well.

The electrical mechandising situation remains very tight as to supplies.

PACIFIC COAST

The recent removal of priority restrictions on rigid iron conduit has so far caused practically no increase in sales, because it is so intimately interconnected with many other roughing-in and wiring lines, of which rubber-covered wire is still rather difficult to secure, and such small fittings as locknuts and connectors are particularly so.

Several large Government installations all along the cost are reaching the electrical order stage and so business perceptibly improved up to mid-November. Prospective orders include the Beaver Falls power project near Ketchikan, Alaska; transmission structures at Rock Island on Columbia River near Grand Coulee; a carrier current system linking eight Bonneville substations and 5 1/3 miles of new 230-kva. construction near Wenatchee, Wash.; and power line extensions to serve night bombing base at Muroc near Bakersfield, Calif.

Dow Chemical is expanding its styrene plant near Los Angeles at a cost of $2,000,000. California is expending $600,000 for plans and specifications for $33,000,000 of urgently needed state structures and institutions.

Electrical machinery orders include a 44-ton Diesel electric locomotive for a lumber company in Northern Sierra region; $60,000 of turbine parts and motors for Bethlehem Steel in Alameda; $30,000 of generator parts for Mare Island; and $35,000 of marine motors and controls for a Stockton yard.

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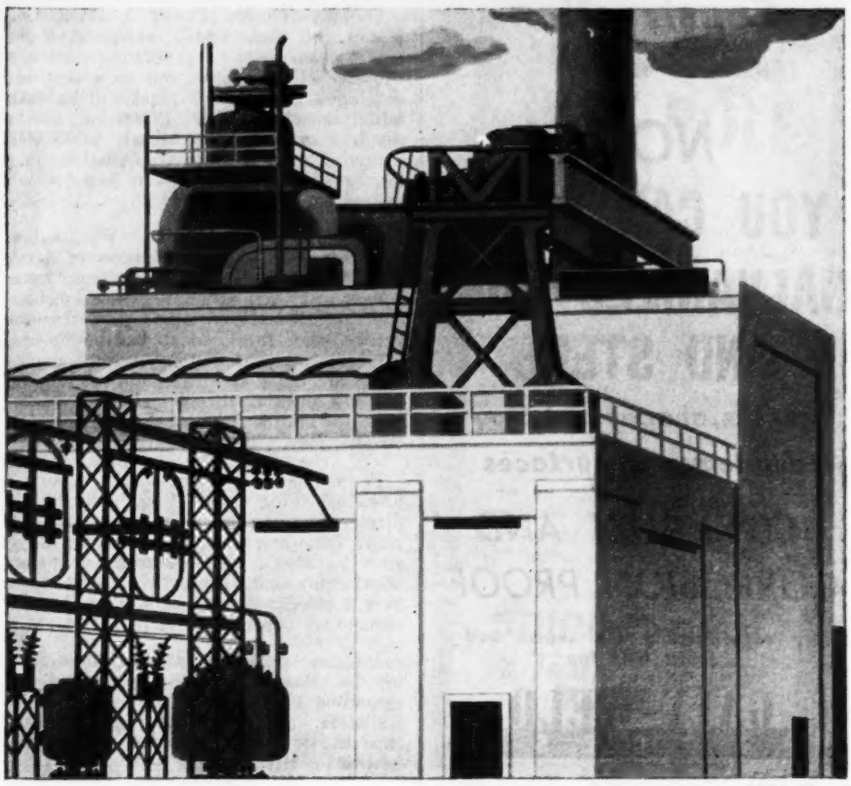

Plans for postwar construction — *to be truly constructive* — must take into account three important factors regarding electrical service.

First, revolutionary changes prophesied for tomorrow will emphasize American industry's dependence on the utilities for light, power and communications service. *Second,* the assured continuity of these vital services will demand *complete* and *lasting* cable protection. *Third,* tomorrow as today, such protection will be best provided *underground*— in Orangeburg Fibre Conduits — *Standard* for main lines — *Nocrete* for feeders, laterals.

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Sales Opportunities

FLORIDA—Florida Power & Light Co., Miami, has plans under consideration for new steam-electric generating station. Project will be carried out as a post-war development. Proposed plant will have an initial capacity of about 19,000 kw., and is reported to cost approximately $1,000,000, including extensions in transmission lines for connection with present high-tension system.

IOWA—War Department, Washington, D. C., has authorized expansion in Army Air Base, including hangars, shops, warehouses and other structures, with mechanical and electrical equipment. Extensions will be made in electrical distribution system, lighting installation, service connections and other facilities. Entire program will cost about $2,416,600 and will be supervised by U. S. District Engineer Office, Omaha, Neb.

PENNSYLVANIA — Pittsburgh Coke & Chemical Co., Grant Bldg., Pittsburgh, plans expansion in by-products chemical plant, including additional one and multi-story buildings, with machinery and electrical equipment. Project is understood to have a priority rating and work will begin soon. Cost reported close to $1,000,000.

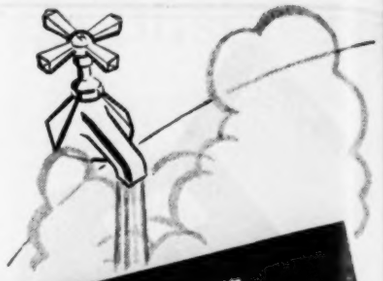
INDIANA—Northern Indiana Public Service Co., Hammond, plans remodeling and extending two power substations, with installation of equipment for increased capacity. It is understood that projects will have a priority rating.

NEW YORK—E. I. duPont deNemours & Co., Inc., Wilmington, Del., has contracted with Navy Department, Washington, D. C., for construction and operation of new plant for manufacture of certain chemicals for war service, consisting of a main one and multi-story building and auxiliary structures, estimated to cost approximately $1,000,000, with machinery and electrical equipment. Work is scheduled to begin at early date.

IDAHO—War Department, Washington, D. C., has approved plans for extensions in airfield, consisting of hangars, shops, warehouses and other buildings, with mechanical and electrical equipment. Also will make additions in electrical distribution lines, lighting system, service connections and other power facilities. Entire project will cost approximately $1,519,000, and will be supervised by U. S. District Engineer Office, Portland, Ore.

UTAH—Southern Utah Power Co., Cedar City, will begin superstructure soon for proposed new steam-electric power plant on site of former station, for which construction award has been made to Harry R. Byers, Inc., Shoreham Bldg., Washington, D. C. Contracts also are being made for primary equipment. Installation will include a 2,500-kw. turbine-generator, high-pressure boiler and auxiliary apparatus. Cost estimated about $300,000, including transmission line for connection with present high-tension system. Project has a priority rating and is scheduled for completion next spring. Company is affiliated with Washington Gas & Electric Co., Tacoma, Wash.

MICHIGAN—State Administrative Board, Capitol Bldg., Lansing, has authorized plans for new power plant at state hospital, estimated to cost approximately $750,000, with



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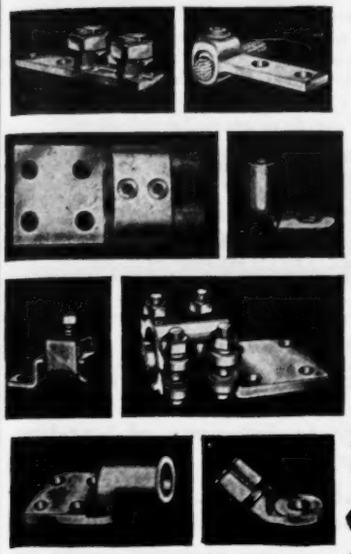

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equipment. It will be carried out as a post-war project, with bids to be asked as soon as materials and equipment are available. Allied Engineers, Inc., Penobscot Bldg., Detroit, is consulting engineer.

CALIFORNIA—Ryan Aeronautical Corp., Lindbergh Field, Harbor Dr., San Diego, will make further extensions in plant for production for government, including additional buildings, with machinery and electrical equipment. Cost estimated about $1,000,000, supplementing a recent appropriation of $300,000, financing in both cases by Defense Plant Corporation. Work is scheduled to begin soon.

VERMONT—Bellows Falls Hydro-Electric Corp., Bellows Falls, is projecting plans for a new hydroelectric generating station on Connecticut River, as a post-war program. Site has been selected in vicinity of Hartford. Development will include a concrete power dam, about 60 ft. high and 590 ft. long, with station to be equipped for initial rating of approximately 37,500 kw. A transmission line will be constructed for connection with present high-tension system. Cost reported over $4,500,000.

NEW MEXICO—War Department, Washington, D. C., has authorized extensions in Army Air Field, including additional hangars, shops, warehouses and other structures, with mechanical and electrical equipment. Additions will be made in electrical distribution lines, lighting system, service connections and other operating facilities. Entire development will cost about $1,160,000. It will be supervised by U. S. District Engineer Office, Albuquerque.

TEXAS—Water Department, Bay City, plans installation of motor-driven pumping machinery, with controls and auxiliary equipment in new high-service pumping station for water system. This will be part of a waterworks expansion program to cost about $305,000, to be carried out, it is understood, as a post-war development. Financing in part has been arranged through federal aid.

OHIO—Inland Division, General Motors Corp., 2727 Inland Ave., Dayton, manufacturer of rubber specialties and plastic parts for automobiles, has plans maturing for new two-story and basement addition for production of rubber products for war service. Cost estimated about $1,000,000, with machinery and electrical equipment. Work will begin soon.

COLORADO—War Department, Washington, D. C., has approved plans for expansion in air field, including additional buildings, with mechanical and electrical equipment, extensions in electrical distribution system and other work. Cost estimated about $992,600. Project will be supervised by U. S. District Engineer Office, Denver.

WISCONSIN—Chippewa Valley Electric Cooperative, Cornell, has engaged Banister Engineering Co., 490 North Snelling Ave., St. Paul, Minn., to make surveys and plans for extensions in rural lines, totaling close to 150 miles, with service connections and other operating facilities. Bids are scheduled to be asked soon.

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LETTER TO THE EDITOR

A Power Salesman's Views on Home Load Building

To the Editor of ELECTRICAL WORLD:

Your editorial, "No Comfortable Sales Program After the War," in the September 30 issue got me to scratching my head. Then I got a pencil and started making marks on a piece of paper. When I got through, I said to myself, "Maybe he would like to know what other folks think."

I have just completed a home-made freezer locker for frozen foods, made from a rebuilt compressor and converted to methol-chloride gas; made from odds and ends found here and there. But how it was made doesn't enter into this story.

This locker is 30-cu. ft. capacity and has a ¾-hp. motor. It has been in operation two months and uses 110 kw.-hr. per month, holding the temperature of the locker at 0 to 5 deg. F.

I have been told that there are 27,000,000 homes in the U.S.A. that are furnace heated, and any family able to own and operate a furnace should not be without a home freezer locker when they become available. Now I know my own box is larger than the ordinary family needs, but to do a correct job it will require an average of ½ hp. for each and every family. Using a little plain mathematics, saying that each box will use 70 kw.-hr. per month times 27,000,000 gives me 1,890,000,000 times 12 months or 22,680,000,000 kw.-hr. per year. This figure is still much smaller than the war debt. But it does mean that there is a wide open field for making use of available utility capacity.

As this is only one of any number of appliances in the domestice field to be sold after the war—you notice I said sold, because even though many people will buy there will still have to be plenty of selling done to some, and it should be done before five years after the war.

It will be a salesman's paradise, provided as you say there is plenty of sweat and foot-work and vision. It should create many jobs for the returning men of honor, the building of these and many thousands of electrical things needed to provide better living conditions, which always promotes better understanding between our fellowmen.

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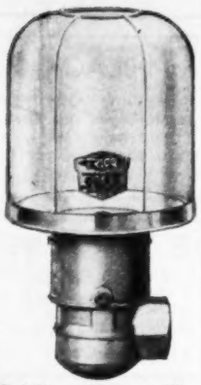

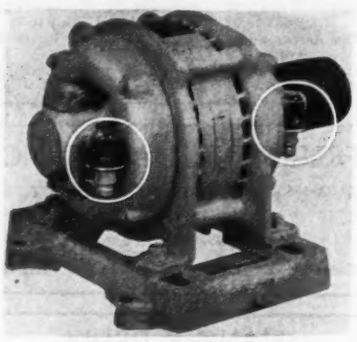

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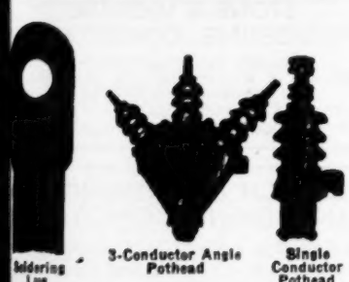

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1304 St. Paul Street Baltimore 2, Md.

New REA Allotments Total $1,230,000

The Rural Electrification Administration has recently approved loan allotments totaling $1,230,000 to 15 cooperatives in ten states. This brings REA allotments to $512,574,301, of which $13,694,500 represents operations during the current fiscal year.

The allotments listed below, will for the most part be used for extension of electric service to farms located near existing lines. All such construction will first have approval of the War Production Board.

ARIZONA—Littlefield Electric Cooperative, Inc., Littlefield, $18,000.

ARKANSAS—First Electric Cooperative Corp., Jacksonville, $75,000; Farmers Electric Cooperative Corp., Newport, $50,000; North Arkansas Electric Cooperative, Inc., Salem, $50,000.

COLORADO—Sangre de Cristo Electric Assn., Inc., Salida, $152,000.

GEORGIA—Irwin County Electric Membership Corp., Ocilla, $50,000; Ocmulgee Electric Membership Corp., Eastman, $30,000.

INDIANA—Parke County Rural Electric Membership Corp., Rockville, $75,000; Rush County Rural Electric Membership Corp., Rushville, $50,000.

KANSAS—Nemaha-Marshall Electric Cooperative Assn., Inc., Axtell, $30,000.

LOUISIANA—Claiborne Electric Cooperative, Inc., Homer, $300,000; Southwest Louisiana Electric Membership Corp., Lafayette, $60,000.

MISSOURI—Ozark Border Electric Cooperative, Poplar Bluff, $25,000.

NEBRASKA—Norris Rural Public Power District, Lincoln, $240,000.

TEXAS—Swisher County Electric Cooperative, Inc., Tulia, $25,000.

SEARCHLIGHT SECTION

POSITIONS VACANT

PRODUCTION ENGINEER — fractional h.p. electric motors. Should have specialty background in single phase motors, having devoted major effort to efficient mass production. Line will have limited size range. Engineering design experience desirable for development of motors for tooling and production. Permanent connection with outstanding Southern California manufacturer entering household appliance field. Send detail of experience and personal qualifications to A.W.A., Box 68, Station K, Los Angeles, California.

ENGINEERS—SEVERAL engineers with distribution training and experience with utility company in the east. Applicants must have technical background; possess a good personality, and preferably not over 40. Submit details of education, experience, character, draft status, and availability. Send photo with letter. P-769, Electrical World, 330 W. 42nd St., New York 18, N. Y.

RELAY TESTER—With utility company in the east. Applicant must have practical field test experience and be qualified to test, calibrate, and install all types of relays. Submit details of experience, education, and availability. P-776, Electrical World, 330 W. 42nd St., New York 18, N. Y.

WANTED MAINTENANCE electrician for modern electrically operated pine sawmill, planing mill and remanufacturing plant situated in Oregon. Permanent operation. Steady, year around employment. P-777, Electrical World, 68 Post Street, San Francisco 4, Cal.

POSITIONS WANTED

ENGINEER—Mechanical electrical experienced in design, construction, operation including generation, transmission, distribution and industrial plants. Also planning and development work. Presently employed—desire change. PW-764, Electrical World, 520 N. Michigan Ave, Chicago 11, Ill.

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DEFENSE PLANT CORPORATION

A Subsidiary of RECONSTRUCTION FINANCE CORPORATION

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AT 47-01 GRAND AVENUE
MASPETH, LONG ISLAND
WED., THURS. & FRI.
NOV. 29, 30, DEC. 1
at 10:00 A. M.

SALE

AT REED & PEARL STREETS
BURLINGTON, NEW JERSEY
MON., TUES. & WED.
DEC. 4, 5 & 6
at 10:00 A. M.

INSPECTION AT BOTH PLANTS—NOV. 24, 25, 27 & 28

$500,000.00

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LARGE QUANTITIES CONDUIT, WIRE & CABLE

CONDUIT FITTINGS — CONDUIT BODIES, WIRING DEVICES — PORCELAIN & GLASS SAFETY SWITCHES, PANELS — LIGHTING FIXTURES, REFLECTORS — FLOOD LIGHTING EQUIP. — POLE LINE MATERIAL — TRANSFORMERS — INSULATING MATERIALS — STARTING SWITCHES

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VALVES, PIPE & FITTINGS FROM 3" TO 24"

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CHAIN TONGS, 18" TO 48", PIPE WRENCHES, BENCH VISES, BEAVER STOCKS, MONKEY PIPE THREADING MACHINES, PIPE CUTTERS — MACHINE BOLTS, SCREWS, RIVETS, NUTS, LAG BOLTS, HOSE, DRILLS, END WRENCHES, STILSON WRENCHES, HACK SAW BLADES, TOOLS, PAINTS, SOLDER, CHISELS, HICKEYS.

Flat Bars, Angle Iron, Reinforced Steel, Channels

LUMBER: TIMBER & DIMENSION LUMBER, TOOL BOXES, LADDERS, CELLOTEX DOORS, PANELBOARD, CONSTRUCTION SHANTIES, FABRICATED, EASY TO ASSEMBLE, EXCELLENT FOR GARAGE; CHICKEN HOUSE, FISHING CABINS; PAINTS.

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HYDRAULIC JACKS, CHAIN HOISTS, ⅛ to 10 TONS; POWER SAWS, CONCRETE JAGER WAGONS, ELECTRIC DRILLS, RUBBER-TIRED BUGGIES, SCALES, STEEL BLOCKS, TARPAULINS, CABLE.

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ALL BIDS ARE SUBJECT TO APPROVAL OF DEFENSE PLANT CORPORATION.

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SURPLUS LIQUIDATORS, INC.

JACOB GOLDBERG—Pres. & Auctioneer

Executive Offices: 1775 Broadway, N. Y. C. Phones: Circle 6-0040-1

POSITIONS WANTED

ELECTRICAL ENGINEER. Graduate, age 42, American, good health, speak Spanish and unencumbered. Majority of past 21 years in supervisory capacity of design and/or construction installations. Prefer foreign service. Available now. PW-778, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

PUBLIC UTILITY EXECUTIVE preferably director of industrial relations. Technical graduate, 10 years varied engineering experience followed by 15 years utility responsibilities including consultation, manager sales promotion, superintendent high pressure power plant, distribution and water works, director personnel and public relations. Successful labor relations, union agreements, grievances, etc. Available on reasonable notice. PW-779, Electrical World, 330 W. 42nd St., New York 18, N. Y.

SAFETY DIRECTOR—presently employed as Safety Director large electric utility, twenty-five years experience as power engineer and safety director, good organizer, natural leader, good public speaker, excellent background, go anywhere, available thirty days. PW-780, Electrical Engineer, 68 Post Street, San Francisco 4, Cal.

SALESMAN AVAILABLE

ELEC. ENGINEER would like to contact used elec. machinery dealer regarding sales position. 25 years experience. SA-781, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS WANTED

GRADUATE E.E., 40, discharged army Captain, married, seventeen years diversified experience with federal and private utilities including: planning, operation, construction, financial studies, sales, and area or regional management and supervision. Knowledge embraces production, transmission, and distribution plant; also industrial power layouts. Desires change, with postwar opportunity. PW-783, Electrical World, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — This advertising service of 34 years recognized standing negotiates for high salaried supervisory technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission's. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 262 Delward Bldg., Buffalo 2, N. Y.

WANTED

WANTED TO Purchase. Back copies of Electrical Engineering, Electronics. B. Login & Son, Inc., 29 East 21 St., New York 10, N. Y.

(Additional Employment Advertising on page 142)

ELECTRICAL DESIGN ENGINEER

A graduate electrical engineer, 30 to 40 years of age, possessing supervisory ability, experienced in the design, layout, and specification of electrical equipment for chemical manufacturing plants.

Applicant should be well grounded in the fundamentals of electrical theory and have a working knowledge of practical electrical problems.

Give full experience, education, age, present salary and salary expected. Enclose snapshot.

It will be necessary to observe the rules and regulations of the War Manpower Commission.

Location — Wilmington, Delaware.

Postwar opportunity.

E. I. du Pont de Nemours & Co.
Personnel Division
Wilmington 98, Delaware

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ENGINEERS WANTED

Experienced electrical men, familiar with low voltage distribution systems to act as sales specialists in important District Offices on following: Panelboards, safety switches, enclosed circuit breakers, bus duct and load centers. Men accepted to receive full training at factory at company's expense before assignment. Write to Supervisor, Technical Employment, 306 Fourth Avenue, Pittsburgh, Pennsylvania, for application form.

WESTINGHOUSE
Electric & Manufacturing Co.

EXPORT SALES ENGINEER

Excellent opportunity for experienced sales engineer who has travelled foreign countries, with thorough knowledge all types prime movers—steam, internal combustion, electric—offered by large western manufacturer with broad postwar field. Mechanical and electrical training essential, knowledge foreign languages, acquaintance foreign purchasing groups in Washington, D. C., or other large centers desirable.

SW-775, Electrical World
68 Post St., San Francisco 4, Calif.

ELECTRICAL ENGINEER

WANTED

Important Machinery firm operating in S. America requires capable Sales engineer for Electrical apparatus. Preferably single, Spanish not essential but advisable. Must be graduate Elec. Engr. with practical experience and Commercial ability for Sales and Service.

SW-782, Electrical World
330 West 42nd St., New York 18, N. Y.

SALES ENGINEER for SOUND EQUIPMENT

Eastern division of national electronic company has permanent position for outstanding sales engineer, contacting large industrial markets on sound equipment. Man must have sales and engineering background, experience selling to industry, and technical knowledge of sound equipment. Engineering degree or extensive engineering experience desired but not essential. Good salary and bonus. Write details to: Dept. 12, Box 429, Grand Central Annex, New York 17, N. Y.

ELECTRICAL DRAFTSMAN

Permanent position in century-old manufacturing company. Minimum of two years experience in electrical drafting in industrial construction. Prefer one who has had limited experience as an electrician.

ANSCO
Binghamton, New York

WANTED

D.C. METERS—Type C6
A.C. METERS—60 Cycle

Send us a list of the D.C. and A.C. meters you wish to dispose of. We purchase large and small quantities.

The Electric Meter Corporation
Incorporated 1915
1776 Broadway, New York 19, N. Y.

WANTED

EXECUTIVE ENGINEERING ASSISTANT

Large midwest electric utility wants graduate engineer about 30 to 35 for work in the fields of rates, rate regulation, cost of service allocations, depreciation studies, etc.

Specific experience in any of the fields will be helpful. Familiarity with electric utility property, a keen analytical mind, efficient job organization habits and a better than average ability in clear and effective expression are essential.

The position is a permanent staff position and offers excellent opportunity to a young engineer with ability and initiative.

P-759, Electrical World
620 North Michigan Ave., Chicago 11, Ill.

KEY MEN NEEDED

Men for key positions are needed to continue our expansion for present war contracts and contracts for post war motors. We specialize on all types fractional horsepower electric motors and need men for key positions in—

Series Motor Engineer
Induction Motor Engineer
Tool Design Engineer
Manufacturing Supt., also
Tool Draftsman
Design Draftsman

If you are experienced in any of these lines, you can share a very interesting and prosperous future with us.

UNIVERSAL ELECTRIC CO.
300 E. Main St. Owosso, Michigan
Our employees have the Army-Navy "E" Award.

Additional Employment and Auction Advertisements on page 141—

Business Opportunity Advertisements on page 143

DIESEL ENGINE WINTON-GENERAL MOTORS

Model 1580 Four Cylinder 14 x 16 330 H.P. Continuous Duty 360 R.P.M. Winton Mechanical Injection Diesel Oil Engine Direct Connected to 225 KW—220 Volt 3 Phase 60 Cycle Generator with Direct Connected Exciter. Complete with Accessories and Control Panel. This unit new in 1936, now in daily service. Manufactory Expansion calling for great power increase therefore this unit for sale.

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SUCCESSFUL OPERATION GUARANTEED

Every Machine in This Ad is Owned Outright By Us

D C MOTORS

	HP	Make	Type	Volts	Speed
1—	1250	G.E.	MPC	550	130
1—	1200	Whse.	Compen.	550	600/720
1—	800	G.E.	MPC	660	600
1—	625	G.E.	MPC	500	130
1—	600	G.E.	MPC	600	650/900
1—	500	G.E.	MPC	230	900
1—	500	Whse.	Compen.	250	840/720
1—	350	G.E.	MPC	220	450
1—	300	G.E.	MPC	230	275/550
1—	250	Al. Ch.		230	525
1—	200	Whse.		230	400
1—	175	Whse.	SK	250	150/525
1—	150	G.E.	MPC	230	250/450
1—	150	G.E.	RC-19A	230	800/1000
1—	130	Cr. Wh.	CMC-65H	550	1200
1—	130	Whse.	SK-185	110	450/1340
1—	125	G.E.	CO-1832	230	625
1—	100	G.E.	LC-50	230	1200
1—	100	G.E.	MPC	230	225/450
1—	100	G.E.	RC-38	230	600
1—	75/100	Whse.	SK-183	230	450/900
1—	75	G.E.	LC	230	500/1000
1—	75	Whse.	SK-183	230	560/1100
1—	60	El. Dy.	258	230	525/1050
1—	50/60	Cr. Wh.	65H	230	500/1000
1—	50	Cr. Wh.	CMC-81H	230	300/900
1—	50	G.E.	RC-19	230	400/1200

TRANSFORMERS

	KVA	Make	PH	Type	Voltage
1—	1667	Pitts	1	OISC	13200x2300
1—	1050	G.E.	3	WCTH	11000x445
1—	525	G.E.	1	HJDD	2300x445
1—	500	Pitts.	1	OISC	13200x2300
1—	333	Moloney	1	C-OISC	22000/11000x2300/575
1—	333	Whse.	1	OISC	2300x460
1—	333	Pitts.	1	OISC	2400x220
1—	300	G.E.	1	H-RP	13200x575/1150/2300
1—	300	Pitts.	3	ODSC	4150x208/120
1—	300	Packard	1	OISC	2200x220/440
1—	200	G.E.	1	H-IDD	26400x115/460
1—	150	G.E.	1	HKS	440x115/230

MOTOR GENERATOR SETS

3 ph 60 cycle

1—1500 KW GE 275 V. Gen. d.c. to 2100 HP 2300 V.
1—1000 KW G. E. 250 V. DC to 1400 HP 2300 V.
1—500 KW G. E. 250 V. DC to 700 HP—440/2200 V.
1—500 KW GE 600 V. DC Gen. d.c. to 700 HP—2200/13200 V. Syn. Motor with Exciter.
1—400 KW GE 250/275 V. Gen. d.c. to 650 HP2300 V.
1—350 KW G. E. 220 V AC Gen. d.c. to 500 HP 250 V. DC motor.
1—300 KW GE 600 V. Gen. d.c. to 435 HP—2300 V.
1—250 KW G. E. 250 V. DC to 375 HP—440 V.
1—200 KW Whse. 250 V. Gen. d.c. to 300 HP—2300 V.
1—175 KW GE 125/250 V. Gen. d.c. to 260 HP—440 V.
1—100 KW GE 125/250 V. Gen. d.c. to 150 HP—440 V.
1—75 KW GE 125 V. Gen. to 120 HP IK 400/2300.
1—50 KW GE 125 V. Gen. to 75 HP KT 4000/2300 V.

TURBO GENERATOR SET

1—500 KW, Whse. 625 Kva., 440 V., 3 ph., 60 cy., 3600 RPM with Parsons 145/175 lb. condensing turbine complete with jet condenser and accessories.

ROTARY CONVERTERS

60 Cycle

	KW	Make	Speed	D.C. Volt	Trans. Volts
1—	1500	Whse.	720	600	2300
1—	1500	Whse.	600	600	11500
1—	1250	G.E.	720	250	2300
1—	1000	G.E.	900	600	13200
1—	1000	Whse.	900	600	11000
1—	750	G.E.	1200	600	2300
1—	750	Whse.	720	250	6600/2300
1—	500	Whse.	1200	600	13200/2300
1—	375	G.E.	1200	250	6600/2300
2—	300	G.E.	1200	600	2300

25 cycle

2—	1500	G.E.	500	225/275	13200/6600
1—	500	G.E.	750	225/275	13200/6600

All units can be furnished with AC and DC controls.

A. C. MOTORS

3 ph. 60 cycle

Synchronous

	HP	Make	Type	Volts	Speed
2—	2100	G.E.	ATI	2300/4600	514
1—	600	Al. Ch.		2200	720
1—	400	G.E.	TS-7647	2300	720
1—	150	Whse.		4000	1800
1—	100	Whse.	G	2200	1800
1—	75	G.E.	TS-7556	220/440	600

Slip Ring

1—	1200	Cr.-Wh.	801-Q	2200	237
1—	800	A. Ch.		440	885
1—	600	G.E.	MT	550	220
2—	600	G.E.	IP	440/2200	720
1—	450	Whse.	CW	2200	875
1—	400	G.E.	IP	440/2200	600
1—	400	Al. Ch.		2300	505
1—	400	G.E.	IP	2200	252
1—	300	G.E.	IM	2300/4000	257
1—	250	G.E.	MT	4000/2300	257
1—	200	Whse.	CW	2200	514
1—	200	G.E.	IM	440	600
1—	150	Whse.	CW-772C	2200	1160
1—	150	G.E.	IM	2200	575

Squirrel Cage

1—	300	Whse.	CS	550	580
1—	300	G.E.	IK	2300	600
1—	175/112	G.E.	IK	440	900/720
1—	125	Whse.	CS	220/550	1150
1—	100	G.E.	IE-13	2200	1800

SYNCHRONOUS CONDENSERS

1—	1000	G.E.	ATI	2200/3800	900
1—	900	G.E.	ATI	2200/6600	1200
1—	750	G.E.	ATI	220/440	900

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units up to 5000 kw
available in stock.

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MOTORS

3 PHASE 60 CYCLE

1—500 HP, 900 RPM, 440 volt, Lincoln slip ring
1—350 HP, 300 RPM, 440 volt, G.E. slip ring
1—250 HP, 600 RPM, 4000 volt, G.E. sync.
1—200 HP, 600 RPM, 2200 volt, G.E., sl rg.
1—200 HP, 450 RPM, 2200/4000 v. G.E. sl. rg.
1—150 HP, 1800 RPM, 440 volts, G.E. sq. cg.
2—150 HP, 1200 RPM, Westinghouse, squirrel cage
1—150 HP, 900 RPM, 440 volt, Al. Ch. sl. rg.
2— 75 HP, 1200 RPM, 2300 volt, G.E. vertical

D. C. 230 VOLTS

2—450 HP, 400 RPM, General Electric MPL.
1—250 HP, 760 RPM, Electro Dynamic.
3—150 HP, 550 RPM, Westinghouse, SK.
1—150 HP, 750 RPM, Electro Dynamic.
1—125 HP, 600 RPM, Westinghouse, SK.
1—100 HP, 625 RPM, G.E.
1— 80 HP, Crocker-Wheeler, 600 RPM.
1— 75 HP, 575 RPM, General Electric
3— 50 HP, 700 RPM, Crocker-Wheeler

VARIABLE SPEED 230 VOLTS

1—90 HP, 470/940 RPM, General Electric.
1—75 HP, 525/1575 RPM, Electric Dynamic.
1—60 HP, 500/1000 RPM, Diehl.
1—30 HP, 225/900 RPM, Crocker-Wheeler.
1—30 HP, 400/1200 RPM, General Electric.
2—25 HP, 650/2200 RPM, Westinghouse.
3—25 HP, 300/900 RPM, Electro Dynamic.
1—15 HP, 300/1200 RPM, General Electric.
1—13/18 HP, 350/1200 RPM, Electro Dynamic.
1— 5 HP, 600/1200 RPM, General Electric.
1— 5 HP, 450/1800 RPM, Crocker-Wheeler.

MOTOR GENERATOR SETS

1—750 KW, 250 volt, Allis-Chalmers, Synchronous.
1— 75 KW, 125 volt, General Electric, squirrel cage.

TRANSFORMERS

2—400 KVA, G.E. 4156-240/480 v. Scott taps.
2—300 KVA, Pittsburgh 7800/440 volts.
3—200 KVA, Allis-Chalmers, 2200/220/440 volts.
3—150 KVA, G.E., 33,000 2300/4000 Y.
4—150 KVA, G.E., 2400/240/480.
3—100 KVA, Westinghouse, 11,430/250 volts.
1—100 KVA, Pittsburgh, 1375/2750-110/220 volts.
3—100 KVA, Westinghouse, 13200 250 volts.
3—100 KVA, Allis-Chalmers, 2200/220/110.
3— 75 KVA, General Electric 2200/220/440.

ALTERNATORS

1—625 KVA, 3600 RPM, 600 volt, G.E.
1—250 KVA, 720 RPM, 230 volt, G.E.
1—225 KVA, 514 RPM, 600 volt, Westinghouse.
1—200 KVA, 3600 RPM, 240 volt, Allis-Chalmers.
1—62½ KVA, 3600 RPM, 220 volt, Allis-Chalmers.

TURBO-GENERATORS

600 KW, Terry dual bleeder condensing Turbine only.
1—500 KW, G.E., 3 ph., 60 cy., 480 volt, bleeder.
1—375 KVA, Westinghouse, non-condensing.
1—300 KW, G.E., 3 ph., 60 cy., 220 volt, cond.
1—200 KW, G.E., 3 ph., 60 cy., 220 volt, cond.

ENGINE GENERATOR SETS

1—150 KVA, General Electric Generator, Ames Uniflow engine.
1—62½ KVA, Westinghouse Generator, Fairbanks company engine.

Complete Line of A.C. and D.C. Motors and Generators

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TRANSMISSION LINE MATERIALS

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EBASCO SERVICES INCORPORATED
Two Rector St. New York, N. Y.

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ELECTRICAL MFG. CO., LTD.
MONTMAGNY, CANADA

1—312 KVA Ridgeway 3 phase, 60 cycle, 3600 RPM, 480 volt, direct connected, **Elliot-Kerr Condensing Steam Turbine,** all in excellent operating condition. Offered for immediate shipment. For detailed specifications write to

ALLIED BARREL CORP.
Oil City, Pennsylvania

DIESELS

ROBERT SCHOONMAKER
Port Washington, Long Island, N.Y
Phone Roslyn 1220

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Air Preheater Corp., The..... 28
*Allis-Chalmers Mfg. Co....8, 9, 56, 57
Aluminum Company of America.. 59
*American Brass Co., The..... 51
American Fork & Hoe Co..... 137
*Anaconda Wire & Cable Co..... 128
Asplundh Tree Expert Co..... 127
*Associated Research, Inc..... 135

Bakelite Corporation 43
*Benjamin Electric Mfg. Co..... 123
*Biddle Co., James G..... 114
Blaw-Knox Co. 63
Buckeye Laboratories Corp.....10, 11
*Burndy Engineering Co..... 50

Celanese Celluloid Corp..... 117
*Collyer Insulated Wire Co..... 33
Combustion Engineering Co....40, 41
*Continental-Diamond Fibre Co... 139
*C-O-Two Fire Equipment Company 116

De Laval Separator Co., The..... 58
Deutschmann Corp., Tobe..... 39
Directory of Engineers..... 140
Duncan Electric Mfg. Co..... 23

Electric Storage Battery Co., The.. 42
Electromaster, Inc. 136
Elliott Co. 6
Engineers, Directory of..... 140

Federal Telephone & Radio Corp. 26
Fibre Conduit Co., The..... 135
Foster Wheeler Corp.....46, 47
*Four Wheel Drive Auto Co..... 48

G & W Electric Specialty Co..... 52
Galv-Weld Products 136
*General Electric Co.
97, 99, 100, 101, 103, 104, 105
Goodrich Co., The B. F..... 16
*Graybar Electric Co..... 5

Hallicrafters Co., The..... 36
Harper Co., The H. M..... 126
*Hazard Insulated Wire Works.... 4
Hubbard & Co..... 125

*Illinois Electric Porcelain Co..... 131
*Ilsco Copper Tube & Products, Inc. 138
Indiana Steel & Wire Co..... 138
*I-T-E Circuit Breaker Co..Third Cover

*Kearney Corp., James R...19, 20, 21, 22
Kidde & Co., Inc., Walter..... 49
*Kuhlman Electric Co.....Back Cover

*Lapp Insulator Co., Inc..... 18
Lincoln Electric Co., The.....24, 25
Line Material Co..... 115

Mallory & Co., Inc., P. R..... 54
Matthews Corp., W. N..... 12
Meter Devices Co..... 139
*Metropolitan Device Corp.
Second Cover

National Electric Products Corp... 64

Ohio Brass Co.....13, 15
*Okonite Co., The..... 4
*Okonite-Callender Cable Co..... 4

*Pacific Electric Mfg. Corp..... 29
Panelyte Division, St. Regis Paper Co. 45
*Pennsylvania Transformer Co..... 38
*Penn-Union Electric Corp..... 137
Philco Corporation 107

*Radio Corp. of America..... 119
*Railway & Industrial Engineering Co. 7
Raytheon Mfg. Company..... 32

*Reliable Electric Co..... 134
Revere Copper & Brass, Inc...108, 109
Rockwood Sprinkler Co..... 44
*Rusgreen Mfg. Company..... 139
Ryerson & Son, Inc., Joseph T.... 111

Schweitzer & Conrad, Inc..... 17
Searchlight Section 141, 142, 143
Simplex Wire & Cable Co..... 14
Slater Electric & Mfg. Co..... 133
*Stackpole Carbon Co..... 60
*Standard Transformer Co., The 30, 31
*Sticht Company, Herman H..... 138
*Struthers-Dunn, Inc. 62
Subox, Inc. 138
*Sylvania Electric Pdts., Inc..... 37

Trico Fuse Mfg. Company..... 139
Tuttle & Kift, Inc..... 118

Union Carbide & Carbon Corp... 43
U. S. Steel Supply Company..... 53
*U. S. Steel Corp..... 53

Wagner Electric Corp..... 34
Wakefield Brass Co., The F. W... 121
*Westinghouse Elec. & Mfg. Co.
27, 55, 113
*Westinghouse Elec. & Mfg. Co., Lamp Div. 35
Westinghouse Electric Elevator Co., Air Conditioning Dept..... 61
West Virginia Pulp & Paper Co... 139

PROFESSIONAL SERVICES 140

SEARCHLIGHT SECTION

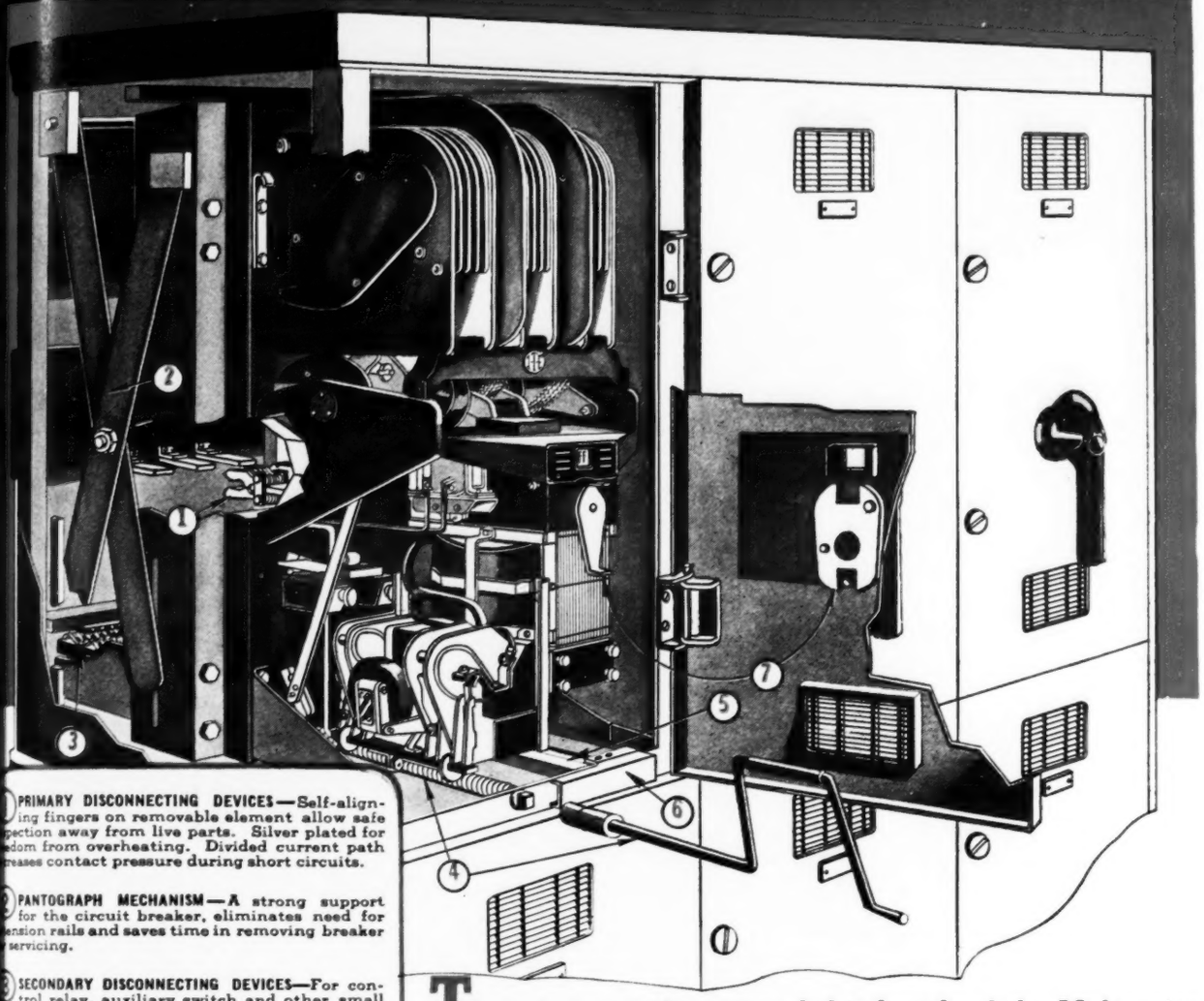
(Classified Advertising)

AUCTION 141
BUSINESS OPPORTUNITIES 143
EMPLOYMENT SERVICE 141
POSITIONS VACANT 141, 142
POSITIONS WANTED 141
SELLING OPPORTUNITIES 141, 143
USED EQUIPMENT 141, 143
Allied Barrel Corp.....143
American Envelope Co.....142
Belyea Co., Inc.....143
Brew, Woltman & Co.....142
Ebasco Services, Inc.....143
Electric Service Co., The.....142
Electric Meter Corp.....142
Goldberg, Jacob 141
Hemphill & Co., J. L.....143
Schoonmaker, Robert 143
Surplus Liquidators, Inc.....141

★These companies have supplied additional buying information on their products in the 1944 edition of the Electrical Buyers' Reference

Details of I-T-E Drawout Switchgear

ARE WELL WORTH YOUR STUDY



1. **PRIMARY DISCONNECTING DEVICES**—Self-aligning fingers on removable element allow safe inspection away from live parts. Silver plated for freedom from overheating. Divided current path increases contact pressure during short circuits.

2. **PANTOGRAPH MECHANISM**—A strong support for the circuit breaker, eliminates need for extension rails and saves time in removing breaker for servicing.

3. **SECONDARY DISCONNECTING DEVICES**—For control relay, auxiliary switch and other small wiring circuits. Self-adjusting, silver plated. Flexible members mounted on removable element. Contacts closed at Test Position of breaker.

4. **DRAWOUT SCREW AND REMOVABLE CRANK**—Quick operating, triple-threaded screw allows the drawout of breaker to Test or Removal Position. Crank has universal joint to allow operator to work comfortably.

5. **INTERLOCK TRIP SHAFT**—Provides safety for circuit and operator by actuating trip mechanism whenever the breaker is moved into or out of contact. Current cannot be broken on disconnecting devices.

6. **INTERLOCK SLIDE**—Connected to trip shaft, must be moved to expose end of drawout screw and allow removable crank to be attached. Crank cannot be in place with breaker closed.

7. **OPERATING MECHANISM**—Operating handle, furnished for both manually and electrically operated breakers, disconnects automatically from breaker when door is opened. Manual operation requires only a ninety degree turn of the handle.

There is a specific reason behind each of the Multumite switchgear details described here . . . either improved performance, safety or convenience. Close study will indicate how completely every contingency is provided for and the thoroughness with which each detail is engineered.

Only a few of the many features necessary to proper circuit breaker protection are mentioned. Catalog 6002 fully identifies and illustrates the requirements for dependable performance, safety and convenience in control and distribution of electric power. Call your nearest I-T-E representative for Catalog 6002 or write to I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.

Representatives in Principal Cities

I-T-E AIR SWITCHGEAR

3 QUESTIONS

AND ANSWERS THAT EVERY ALERT ENGINEER WILL APPRECIATE

1 Q: WHY IS THE KUHLMAN CONSTRUCTION OF B.I. (BENT IRON) CORE TO BE PREFERRED FOR SMALL SIZES?

A: A designer of a Kuhlman B.I. Transformer is not handcuffed. He may use any shape of core—Round—Square—or Rectangular, (as shown in Fig. 1 A, B & C) or any shape of window, Short—or Long, (as shown in Fig. 2 A & B,) that in his judgement fits the particular conditions.

This is a distinct advantage to the designer when certain performance characteristics must be attained. The designer is not compelled to sacrifice some other characteristics such as exciting current, reactance or excess weight.

2 Q: WHAT'S WRONG WITH THE OLD TYPE CORE?

A: In the first few years of automobile manufacturing the old conventional steel having a tensile strength of 60,000 pounds was the only steel available and designers were compelled to pile on volume and weight to make the product stand up. But when alloy's having a tensile strength of 100,000 pounds became available the designers reduced the volume and weight of cars without sacrificing strength or utility of the manufactured product.

Just so with the steel that makes up the cores of transformers. The Cold-Rolled steel has improved magnetic qualities but must be magnetized in the proper direction which can only be done when the material is bent around the corners (as shown in Fig's 4 & 6). The Kuhlman B.I. core was the first of such constructions made available to the public which utilized the advantages of the improved qualities of Cold Rolled magnetic steel. (The old conventional construction is shown in Fig's 3 & 5).

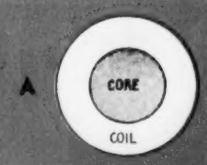
3 Q: WHY SHOULD A PURCHASER PREFER B.I.?

A: Kuhlman started the ball-a-rolling ten years ago—and today more than 75% of all small distribution transformers (25 Kva. or smaller) are of the B.I. type or a modification which utilizes the advantages inherent in cold-rolled steel for cores.

In buying a Kuhlman B.I. core transformer you get a transformer that uses the highest grade materials available and one which uses those materials to the best advantage.

KUHLMAN ELECTRIC CO.

BAY CITY • MICHIGAN



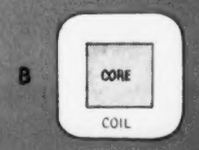


Fig. 1

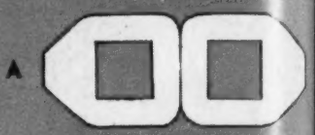


Fig. 2

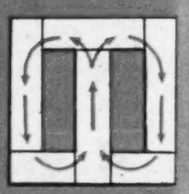


Fig. 3

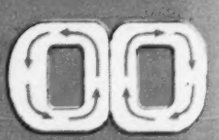


Fig. 4

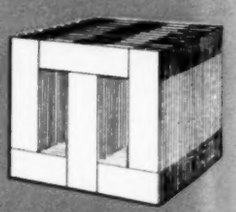


Fig. 5

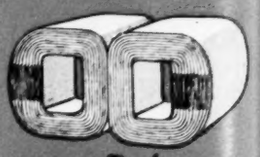


Fig. 6